ON

THE ROCKEFELLER FOUNDATION

Annual Report for 1921

The Rockefeller Foundation

Annual Report

1921

The Rockefeller Foundation
61 Broadway, New York

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OFFICERS, MEMBERS, AND COMMITTEES
1921

*Resigned February 28, 1921
**Died April 4, 1921.

THE ROCKEFELLER FOUNDATION

OFFICERS, MEMBERS, AND COMMITTEES
1922

*Died January 25, 1922.

THE ROCKEFELLER FOUNDATION

President's Review

To the Members of the Rockefeller Foundation:

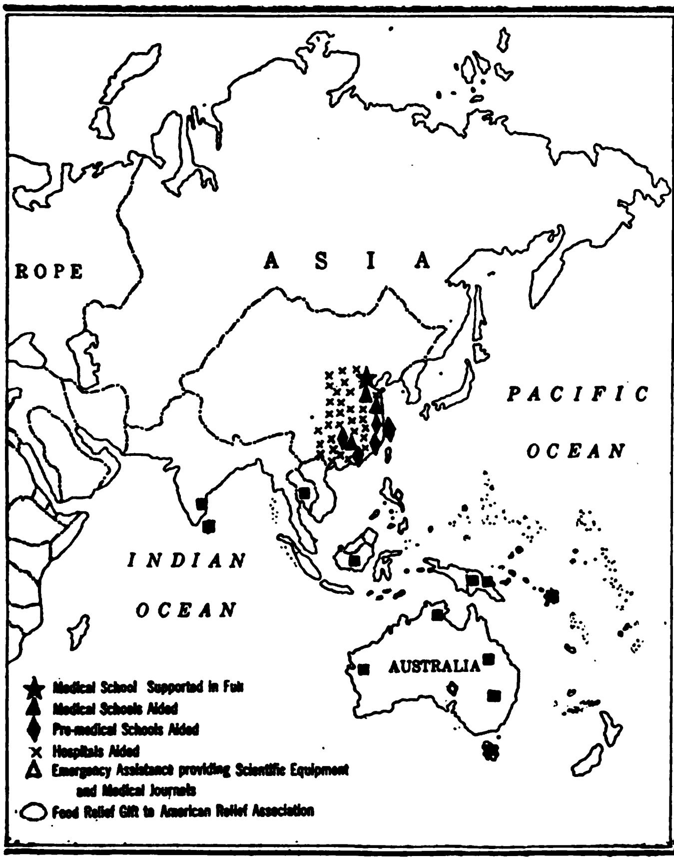
Gentlemen:

I have the honor to transmit herewith a general review of the work of the Rockefeller Foundation for the period January 1, 1921, to December 31, 1921, together with the detailed reports of the Secretary and the Treasurer of the Foundation, the General Director of the International Health Board, the Director of the China Medical Board, and the General Director of the Division of Medical Education.

Respectfully yours,
GEORGE E. VINCENT,
President.

Fig. 1.—Map of World-wide Activities of

It is the purpose of the Rockefeller Foundation and its departmental boards to have a part in the world-wide movement for preventing disease and bringing about improved conditions of health. In 1921 aid was extended to five medical schools in Canada, to one in England, one in Belgium, one in Brazil, and one in the United States. In China a modern medical school in Peking was supported in full and three other medical schools, five pre-medical schools, and twenty-nine hospitals aided. Two million dollars were given to Harvard for a school of public health; and the School of Hygiene and Public Health at Johns Hopkins University, and courses in hygiene at São Paulo, Brazil, supported. A campaign against yellow fever was continued in Mexico and Central and South



the Rockefeller Foundation

America. Aid was given to ten southern states and two foreign countries to continue the work of malaria control. In seventy-seven counties in sixteen southern states, county health organization on a full-time basis was promoted in co-operation with state and local agencies. Hookworm work, now merged in county health programs in the Southern States, was prosecuted abroad in eighteen governmental areas. Anti-tuberculosis work in France was brought close to the point of complete transfer to French agencies. The 1920 gift of $1,000,000 for the relief of European children was completed. Emergency assistance in the form of scientific journals and apparatus for medical schools was continued in five countries and extended to four other countries in Europe

PRESIDENT'S REVIEW

The Year in Brief

During the year 1921 the Rockefeller Foundation (1) continued a quarter-million annual appropriation to the School of Hygiene and Public Health of Johns Hopkins University, (2) pledged two million to Harvard for a school of health, (3) contributed to public health training in Czechoslovakia, Brazil, and the United States, (4) aided the Pasteur Institute of Paris to recruit and train personnel, (5) promoted the cause of nurse training in America and Europe, (6) underwrote an experimental pay clinic in the Cornell Medical School, (7) formally opened a complete modern medical school and hospital in Peking, (8) assisted twenty-five other medical centers in China, (9) promised a million dollars for the medical school of Columbia University, (10) contracted to appropriate three and one half millions for the rebuilding and reorganization of the medical school and hospital of the Free University of Brussels, (11) made surveys of medical schools in Japan, China, the Philippines, Indo-China, Straits Settlements, Siam, India, Syria, and Turkey, (12) supplied American and British medical journals to 112 medical libraries on the Continent, (13) supplemented the laboratory

equipment and supplies of five medical schools in Central Europe, (14) defrayed the expenses of commissions from Great Britain, Belgium, Serbia, and Brazil, (15) provided 157 fellowships in hygiene, medicine, physics and chemistry, to representatives of eighteen countries, (16) continued a campaign against yellow fever in Mexico, Central and South America, (17) prosecuted demonstrations in the control of malaria in ten states, (18) co-operated in hookworm work in nineteen governmental areas, (19) participated in rural health demonstrations in seventy-seven American counties and in Brazil, (20) neared the goal of transferring to French agencies an anti-tuberculosis organization in France, (21) provided experts in medical education and public health for counsel and surveys in many parts of the world, and rendered sundry minor services to governments and voluntary societies. These were done in part by the Foundation directly, but chiefly through its departmental agencies—the International Health Board, the China Medical Board, and the Division of Medical Education.

Telescope and Microscope

"Cure looks through the microscope, prevention through the telescope" is the clever phrasing of a successful American health officer. If the figure is not too closely examined it serves its

purpose. There has been and still is a marked difference between the average physician's point of view and the sanitarian's. The former deals with disease which has manifested itself; the latter seeks to foresee and to forestall its occurrence. The one thinks of the individual patient, the other of the community as a whole.

It is sometimes cynically asserted not only that the attitudes of the two differ, but that their interests clash. In a town from which malaria had been banished, a local doctor who had almost specialized in chills and fever was asked how his profession had been affected. "If it hadn't been for the influenza we'd have gone broke; that saved us," was the half-jocular reply. If the two things are looked at narrowly, locally, and for a brief period, there is undoubtedly a conflict of interests.

But the leaders of the medical profession have not taken the myopic view. As a matter of fact they have been the very prophets and promoters of preventive medicine. The men who have done most to introduce the telescope have, with certain notable exceptions, been trained primarily to concentrate upon the microscope. With them cure and prevention have been not sharply contrasted but closely related ideas. They have increasingly regarded experience with disease in

individuals as a means of protecting the community against it.

The progress of public health depends upon the appreciation, sympathy, and support of the medical profession. Doctors will gradually come to think of themselves and to be regarded by the public as primarily responsible for keeping people well. Periodic physical examinations, the early discovery of incipient maladies, warnings against environmental dangers, the wise control of diet, insistence on appropriate exercise, suggestions about personal and social life, will in increasing measure replace medicines, hospitals, and sanatoria; may even reduce the demand for surgical service. Who knows but that the doctor of the future, receiving an annual retaining fee from his clients, will feel no embarrassment in taking the initiative and in keeping a watchful eye upon them? Then a case of illness would be not the physician's opportunity but a reflection upon his vigilance.

Progress in Prevention

Jenner's discovery of vaccination for smallpox, Pasteur's researches in the causation of various diseases by bacteria and microbes, the use of vaccines and sera, Lister's introduction of antiseptic surgery, are striking illustrations of the scientific knowledge of the origin, spread, and

prevention of certain maladies which has been made available since the end of the eighteenth century, and especially during the last fifty years. Today hundreds of trained investigators in many countries are verifying, revising, and adding to this body of truth upon which all progress in preventive medicine depends.

The application of part of this knowledge by men of imagination and organizing ability has been a boon to mankind. The presence of smallpox is now a disgrace to any civilized community or country; cholera and plague have disappeared from the leading nations; typhoid fever has been enormously reduced; malaria and hookworm disease are giving ground; yellow fever is being narrowly restricted; typhus is practically unknown among a cleanly people; the fear of diphtheria has been largely allayed. Such victories as these, together with advances in general sanitation, higher living standards, more attention to individual health habits, have resulted in steadily falling death rates in all the more progressive countries.

But it is too early to feel complacent. Only a beginning has been made. Many diseases still baffle the health authorities. Whole regions have been almost untouched. Even the most advanced communities fall far short of what might be attained. The average individual re-

mains relatively ignorant and negligent of sanitary science and of personal hygiene. Almost all physicians are still too exclusively concerned with the individual aspect of disease.

Stages in the progress of preventive medicine are distinguishable. First comes control of the physical environment through pure water, milk, and food supplies, adequate sewerage and refuse disposal systems, improved housing, heating, and ventilation. Then follows control of diseases other than those whose causes are water and food borne. Various forms of occupational hazards and maladies are also attacked. Concern for the welfare of mother and child is a prominent feature at this stage. The third stage emphasizes the vital part which personal hygiene plays. It is roughly estimated that 80 per cent of the maladies which produce the total death rate cannot be directly controlled by the sanitarian. He must persuade individuals to conform to the laws of health and to report promptly the first sign that anything is amiss.

A fourth phase just beginning to emerge has to do with economic, social, and mental influences. Income, standard of living, opportunities for social intercourse and recreation, all have important relations to individual and community health. Mental hygiene, which is coming to be recognized as a part of public health, deals with

problems of defects and delinquency in children and criminality in adults, with nervous and mental disorders, with the classification, treatment, and custodial care of the feeble-minded and insane, and related questions. To the support of the work of the National Committee for Mental Hygiene the Rockefeller Foundation contributed during 1921, $86,370.57.

Changing Ideals of Health

Advances in the cure and prevention of disease reflect a shifting of emphasis and a gradual revision of the idea of health itself. Being "up and around" or "I can't complain" represents a far from stimulating conception of bodily prosperity, yet a "vertical rather than a horizontal position" is one criterion. Freedom from conscious pain would seem to be almost the obvious starting point for any useful standard of health, yet even this may be misleading. Conformity with objective norms such as average temperature, height, weight, blood pressure, condition of various organs, results of blood and other analyses, represents a more trustworthy basis of valuation. But after all these are at best negative or neutral ideals. There is a growing demand for a positive conception which in the individual registers itself in a keen sense of physical and mental vigor, a joy of living.

There is a tendency in certain quarters to extend the meaning of preventive medicine from merely negative measures to include more positive and constructive ideals of community or national health. Sanitation, control of contagion, protection against many other menaces, have become in advanced countries accepted procedures. Attention is now directed to more positive things, education of the public in personal hygiene, nutrition for young and old, physical exercise and mass athletics, provision for mental and emotional satisfactions through social and recreational activities.

On the other hand, probably the great majority of public health officers who are engaged in practical field work are rather dubious about giving, at least for some time to come, so broad a meaning to the idea of preventive medicine. They feel that so much remains to be done on the negative side that anything which may withdraw public attention from sanitation, control of contagious diseases, infant welfare, medical inspection of school children, and a somewhat narrower conception of personal hygiene, may for the present do harm rather than good. But this reluctance represents a demand for practical efficiency, not a failure to realize that with the progress of knowledge the idea of health is being reinterpreted in fuller and more positive terms.

The Demand for Trained Leadership

Even a hasty glance at the gains which have been made in safeguarding human lives makes one realize how much scientific knowledge, specialized skill, and organized capacity have been called into service. The expanding idea of health is adding new types of technically expert individuals to the personnel of health work. The list now includes: officers and chiefs who are in general charge, sanitary engineers, laboratory directors who deal with bacteria, microbes, animal parasites, et cetera, and prepare vaccines and sera, specialists in statistics of births, sickness, and deaths, field experts in the control of epidemics,

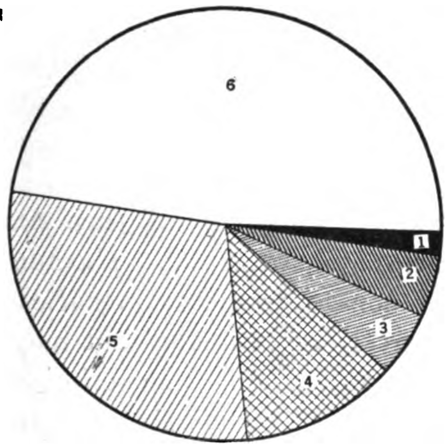


Fig. 2.—Full-time Health Workers in United States, 1921

	Number	*Per cent*
1. Officers of the United States Public Health Service...	200	1.9
2. Principal executives employed by states, cities, and counties..........	470	4.5
3. Subordinate executives ...	500	4.8
4. Laboratory workers, public health laboratories	1,200	11.6
5. Plumbing, sanitary, dairy, and food inspectors.....	3,000	28.9
6. Public health nurses employed by public agencies	5,000	48.2

administrators of clinics, hygienists for infants, medical inspectors of school children, mental hygienists and psychologists, leaders in health education for schools and the general public, visiting nurses, laboratory technicians, food and sanitary inspectors.

In the United States there are at present about 10,000 persons engaged in public health work under Federal, state, and municipal or county auspices. In Great Britain probably an equal number are giving all their time to the work of preventive medicine. The number in the service of non-governmental agencies of all kinds can scarcely be estimated but may represent nearly as many more. The self-governing Dominions employ a considerable number of professional sanitarians. In Continental Europe health organization has not as a rule reached so high a degree of development as in the British Isles. In many tropical countries, e.g., India, Java, the Philippines, both curative and preventive medicine are administered by corps of trained government officials. In all parts of the world there is an increasing demand for men and women competent to do different kinds of public health work. A forecast of the probable number needed during the next ten years in the United States calls for 20,000 persons.

Only in the last few years have opportunities

for special public health training been available in the United States. With exceptions almost negligible in number, American health officers have had no other formal training than that of doctors of curative medicine. They have gained what special competence they may possess in the hard, wasteful, and one-sided School of Experience. That a few have attained the level of "sanitary statesmen" is an evidence of exceptional ability and character, not a vindication of rule-of-thumb, trial-and-error methods. The future of preventive medicine depends upon drawing first-class men and women into the

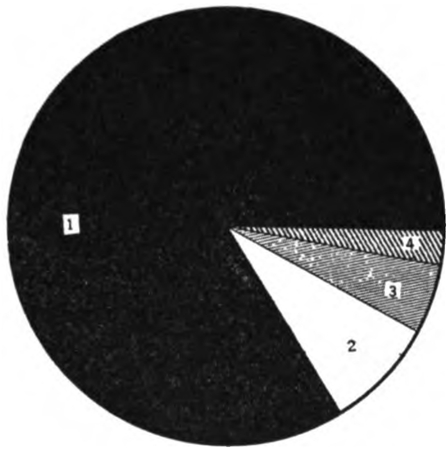


Fig. 3.—Professional Training of Health Officials

This chart is based on a study of the professional training of the responsible heads of health departments in seventy-two municipalities and forty-eight states. Less than 11 per cent of those filling these important positions have had special preparation for their work

	Number	*Per cent*
1. Physicians without public health training	101	84.2
2. Physicians with public health training	10	8.3
3. Laymen without professional training	6	5.0
4. Engineers with public health training	3	2.5

profession and giving them efficient, modern, specialized training and supervised practical experience.

Handicaps to Recruiting

It is not to be denied that on the whole the best ability has been drafted into the service of curative rather than of preventive medicine. More than four hundred replies to questions recently put to students now enrolled in leading American medical schools disclose an attitude of ignorance, indifference, even antipathy with respect to a career in public health work. The reasons these young men give either for not considering at all or for deciding against such a life work are: (1) it is not a socially recognized, clearly professionalized calling; (2) there are no special schools for adequate training; (3) tenure and promotion depend not on merit but political "pull"; (4) salaries are meager; (5) the private practice of curative medicine is more reputable, independent, profitable, and satisfying.

These young men are in many respects uninformed and misinformed. Preventive medicine has already gained the status of a profession and is making rapid progress in public favor. At least two special schools of high rank are offering a thorough and appropriate training. An increasing number of important posts are freeing

themselves from the trammels of "spoils politics." The salary received by a health officer of full rank probably exceeds the income of the average private practitioner. Private practice has many disadvantages: excessive overtime and night work, poor collections, the necessity of dunning patients, little chance to study, constant economic pressure, a heavy burden of unpaid service, competition with quacks and charlatans, temptation to surrender scientific ideals. Public health service, on the other hand, is making a strong appeal to many men and women of imagination, courage, and social spirit just because it does not involve most of these things and offers many positive attractions.

Yet it must be admitted that the sceptical undergraduates are not wholly wrong. Public ignorance and indifference, invidious comparisons, lack of sound training in many officials, prejudice against law enforcement, delay the full appreciation of what preventive medicine means to society. The establishment of adequate schools has been a recent event. A few disheartening instances of political tampering with health departments have occurred of late. It is also true that the level of pay is far too low. Even the few highest salaries suffer painfully in comparison with the annual incomes of leading private consultants and surgeons. A greater

share of popular admiration, larger freedom from control, close personal relations with appreciative individuals, a deeper sense of professional pride, probably are still the portion of the practitioner of curative medicine. Persistent efforts, then, will be needed to make public health careers more attractive to the persons best fitted for successful work. Much can be done to enlighten and challenge medical students and young graduate doctors, but the problem calls for something far more fundamental than that.

The Responsibility of the Public

The cry is frequently heard that this governmental service or that "must be taken out of politics." In one sense this is absolutely essential to efficiency. A public function which calls for technical expertness is hopelessly handicapped if it be treated as the spoils of a political boss or of a victorious party machine. To no public service does this apply more strikingly than to a department of health. The moment efforts are made to influence appointments, promotions, salaries, policies, law enforcement, by political pressure for individual or party ends the demoralization of the work begins. The degree to which such things are possible is an index of the intelligence, spirit, and character of any community.

Yet in another, the original, meaning of politics public health ought to be always in politics. The safeguarding of the health of the people is a community task and responsibility. It is a proper and important subject for public attention and discussion. Officials are in duty bound to present their programs and budgets to boards, councils, and the public and to give convincing reasons for the measures and expenditures that are proposed. One of the essential qualifications of a successful health officer is the ability to explain his policies so as to win support for them. The hookworm campaigns of the International Health Board, for example, are always preceded by systematic education of the community in the cause, effects, cure, and prevention of the disease. Only when people understand the purpose and methods of public health measures can they be counted upon to co-operate willingly and effectively.

But obviously the busy health officer and his assistants cannot assume sole or even the chief responsibility for creating and maintaining the popular understanding and backing essential to the success of modern and progressive health policies. Elected officials, public-spirited private citizens, the schools, public and private, the press, chambers of commerce, women's clubs, social agencies, voluntary health associations are

the organs by which counties, towns, cities, and states should be kept constantly conscious of health measures until these have become a part of the accepted and well-administered routine of daily life. Then vigilance becomes the price of safeguarding what has been achieved and the means of supporting new plans for further advance. In the long run under representative government a community will get the kind of health administration that it deserves.

Until recently there has been little or no co-operation among the scores of voluntary health societies in the United States which are seeking to educate the public and to promote various health measures. The result has been a good deal of duplication, some working at cross purposes, a certain confusion in the public mind. It is encouraging to note that ten of the largest and most influential of these societies have formed a National Health Council, taken offices in the same building, and are working out plans for better team-work. During 1921 the Rockefeller Foundation contributed nearly twenty thousand dollars to the budget of this central bureau.

A West Point of Hygiene at Johns Hopkins

The International Health Board realized early in its history that a chief problem in disease prevention would be to find men qualified both

scientifically and practically to do the work. An ordinary medical school education is not enough. There must be special training in the scientific principles, the administrative methods, and the point of view of preventive medicine and public health. So the Board decided to establish a school of health under the auspices of a university and in close relations with a modern medical school, but at the same time a separate institution with its own buildings and equipment, its own teaching staff, its own professional aims, its own *esprit de corps*. After a study of the various possibilities it was decided in 1916 to ask Johns Hopkins University to assume responsibility for establishing a School of Hygiene and Public Health for which the Rockefeller Foundation undertook to supply such sums as might be agreed upon as necessary for buildings, equipment, and annual maintenance.

In 1918 the new school, housed in temporary quarters, and equipped and manned, opened its doors. Courses of study leading to the degrees of Doctor of Public Health, Doctor of Science in Hygiene, Bachelor of Science in Hygiene, and to the Certificate in Public Health, were offered. Brief, intensive courses for active health officers were announced, and opportunities were promised to other types of special students. For the academic year 1920–1921 the faculty numbered

forty; 122 students were registered, of whom fifty-six were candidates for degrees or a certificate. The special six weeks' course for health officers enrolled twenty-nine students. The health departments of six states and of Costa Rica and Porto Rico were represented. A brief course for a group from the field staff of the International Health Board was also provided. In addition to the regular courses twenty-one public lectures on selected topics in hygiene and preventive medicine were given by prominent specialists.

The school has three leading aims: to provide a fundamental scientific training, to afford practical field experience under competent supervision, and to add to the knowledge of hygiene. The laboratory and lecture courses deal with: (1) the micro-organisms which are the inciting causes of disease, (2) the study of resistance and immunity, and the preparation of vaccines to protect against certain infections and of sera to mitigate their virulence, (3) the primitive animal parasites, for example, the blood parasite which causes malaria, the ameba of dysentery, (4) the parasitic worms of many kinds, of which the hookworm is the best known, (5) the insects by which diseases are communicated, such as the mosquitoes that spread malaria and yellow fever, (6) the collection, arrangement, and interpreta-

Fig. 4.—Students at work in the bacteriological laboratory of the School of Hygiene and Public Health of Johns Hopkins University

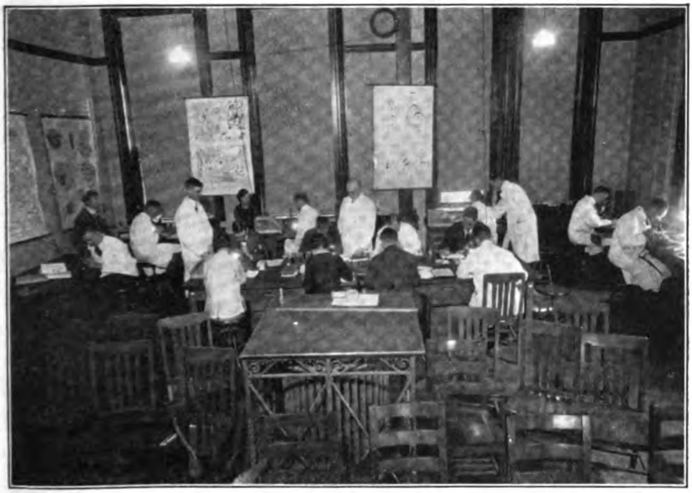


Fig. 5.—Class in protozoology, Johns Hopkins School of Hygiene and Public Health

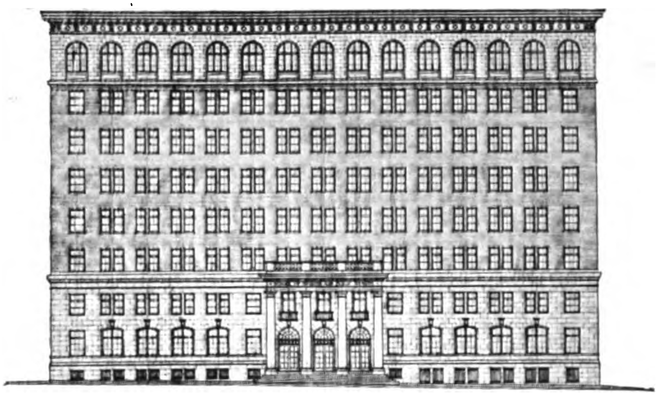


Fig. 6.—Architect's drawing of proposed new building to house the School of Hygiene and Public Health of Johns Hopkins University

Fig. 7.—The "Pay Clinic" of Cornell University Medical College. The picture shows the main entrance hall of the clinic, where new patients are admitted and directed to the various departments after the necessary general information has been secured, appointments made, and fees paid. Close co-operation of a group of specialists in all the leading branches of medicine makes possible careful diagnosis and thorough treatment at an expense which patients of moderate means can afford

tion of statistics about births, deaths, sickness, et cetera, (7) the methods of controlling infectious diseases, especially epidemics of various communicable diseases, (8) the problems of water supply, sewerage, disposal of refuse, housing, ventilation, (9) the functions of the human body in relation to health, (10) the chemical aspects of hygiene, (11) the significance, for preventive medicine, of mental and nervous diseases, delinquency, crime, feeble-mindedness, and insanity, (12) the principles of nutrition and diet, (13) the legal aspects of sanitation and hygiene, (14) the rules of health for the individual, (15) maternity and child hygiene, and (16) the organization and administration of public health work.

Actual experience in the field is gained by visits to various centers of sanitary and health activity and by volunteer service in the Baltimore Department of Health, or under the Maryland State Board, or in connection with the United States Public Health Service. Summer vacation employment with state or municipal health boards or other agencies provides valuable first-hand contact with problems of hygiene and administration. With increasing numbers of students, the difficulties of finding enough apprentice posts and of making sure of educative supervision will be serious. Plans are already under way to establish a special training area, a

field laboratory. Washington county, Maryland, with a population of 60,000 almost equally divided between city and country, has been selected for this purpose. The county health unit will include: a director, a sanitary inspector, a laboratory technician, a clerk, an attendant, and three nurses. A permanent headquarters, a laboratory, and motor cars will be provided. A sanitary and contagious disease survey will be made and an organization for dealing with the conditions will be created. This plan will furnish opportunities for training students and for testing methods. The project is jointly supported by the Maryland State Board of Health, local community and county organizations, the United States Public Health Service, the International Health Board, and the School of Hygiene and Public Health.

The investigative work of the School has covered a wide range of problems. A volume of scientific contributions made by members of the staff and published during the year contained fifty-five papers. *The American Journal of Hygiene*, of which several numbers have appeared, is published under the auspices of the School. It will confine its articles largely to results of research in the laboratory and the field. An active society of hygiene has been established. The chief field research activities of this period in-

clude: an investigation of the diphtheria situation in Baltimore, a special study in Trinidad of hookworm eggs and larvae in the soil, demonstrations in the feeding of undernourished children, a co-operative survey of health conditions among the school children of Baltimore. In the last investigations 6,000 children were weighed and measured; 1,500 were given medical examinations. The results showed that between 20 and 30 per cent of the children were 10 per cent or more under the normal weight for their ages. Much the same situation had been found in New York and other eastern cities of the United States.

For the current support of the School in 1921 the Foundation contributed $250,000. It has also promised to give money for a new building and for additional equipment. This building, which will be close to the Medical School and Hospital, will contain laboratories, lecture rooms, a library, a museum, an auditorium, and will be provided with all the essential apparatus and other equipment for instruction and investigation.

Harvard Expands its Health Course into a School

Harvard was the second American university to establish a course in public health training. The University of Pennsylvania was the pioneer. By joining forces with the Massachusetts Insti-

tute of Technology, Harvard was able to offer a fairly well-rounded curriculum of fundamental studies in preventive medicine and sanitary engineering. Tropical medicine was also given an important position which has been well maintained. From the outset stress was laid upon work in the field. Every candidate for a degree was required to make a sanitary or health survey in a community near Boston. Fortunately a good many towns and smaller cities with creditable health departments were easily accessible. Graduates of the Harvard-Technology course gained useful practical experience. They were successful in securing posts in health departments and in other services.

More recently Harvard, through its medical school, took the lead in establishing courses of training in the field of industrial hygiene, which deals with the problems of fatigue, occupational disease, sanitation of mines and industrial plants, physical and medical examination and care for transportation, factory, and commercial workers, education in personal hygiene, mass athletics, recreation, et cetera. The co-operation and financial support of manufacturing and retail establishments in and near Boston were secured. A number of investigations were made to determine the causes and to discover ways of preventing or minimizing certain maladies which are traceable

to industrial processes. Students enjoyed opportunities for concrete experience in connection with the sanitation and hygienic administration of factories and large department stores. An important publication, *The Journal of Industrial Hygiene*, has been established under the auspices of this division of the Harvard Medical School.

Admirable as the work in public health training with its later emphasis on industrial hygiene was, the Harvard authorities were not satisfied. They felt the need of adding departments which were lacking—for example, public health administration and epidemiology and vital statistics—and of strengthening other courses which were undermanned, inadequately equipped, and too meagerly supported. There was a desire to reorganize and unify the whole undertaking into a separate school of health which should have its own headquarters and teaching staff. It was estimated that to accomplish this and to provide for future growth additional funds to the amount of $3,000,000 would be required. Toward this the Rockefeller Foundation appropriated $1,660,000, and agreed if certain contingencies should arise during the next five years to supply $500,000 more. The remainder of the total sum required was set aside or pledged by Harvard, and the organization of the new institution is well under way.

The Harvard School will be fortunate in having within easy access numerous urban and rural health departments, city and state laboratories, a large hospital for contagious diseases, industrial and other clinics, factory and store health systems, the port quarantine stations, the Carnegie Nutrition Laboratories, and many voluntary health associations with their clinics and nurses. All these institutions and agencies will afford most valuable experience for students and opportunities for fruitful investigations. While the Harvard School will include all the fundamental subjects it will not in every respect duplicate the work at Johns Hopkins. There will be differences in specialization and emphasis, so that the two institutions together will enrich and widen the field of investigation and extend the facilities for training. Advanced students may well study both in Boston and in Baltimore.

Health Training at Home and Abroad

New York University has recently completed a building a large part of which is to be rented as a branch laboratory of the New York State Department of Health. The University authorities were anxious to add to the building another floor which should house a clinic for the teaching of personal, infant, school, and industrial hygiene. The plan also included the remodeling and

equipping of a neighboring building as a museum to display models and other exhibits in sanitation, ventilation, industrial hygiene, and housing. For the carrying out of this project the Rockefeller Foundation contributed $35,000.

One essential kind of training takes the form already mentioned of special intensive courses for persons who are actually engaged in health work. State departments of health and the United States Public Health Service are conducting institutes to meet this need. In several cases the Foundation through the International Health Board gave funds to supplement the appropriations of state boards of health for institute teaching. A small contribution was also made to a state department which is testing the possibilities of correspondence instruction for local health officers and their staffs.

The Pasteur Institute in Paris as a result of the war was seriously threatened not only with curtailment of its activities, but with a lack of new workers who should receive training, engage in research, and thus be prepared gradually to assume responsibility for the future of this world-famous center and its several branches. To supply fellowships for a transition period and to help defray the costs of training assistants the Foundation gave $30,000 in 1921 and pledged other sums on a diminishing scale for the next two years.

The new Ministry of Health in Czechoslovakia early sought the co-operation of the International Health Board, which for two years has had a resident representative in Prague. Fellowships for health training in the United States were provided. An expert in public health laboratory organization was lent to the Government. Next a plan was elaborated for creating in Prague an institute of public health which should include central laboratories for diagnostic purposes, for producing vaccines and sera, and for aiding food inspection, together with a division for training health officers. A complete group of new buildings has been planned, to be erected on an easily accessible and ample site at a total cost for land and laboratories of about $706,000, of which the Foundation has promised to supply $378,000, or more than half.

During 1921 the International Health Board continued to contribute toward the maintenance of a department of hygiene in the medical school of São Paulo, Brazil. While a professor from the United States was in charge, young Brazilian hygienists who were trained in America on Foundation fellowships assumed increasing responsibility and proved themselves capable teachers and promising investigators.

From time to time during several years proposals have been made to establish in London a

central school of public health. In June, 1921, a Royal Commission recommended that such an institution be created, preferably in affiliation with the University of London. The possibilities of carrying out this recommendation were discussed by British officials with representatives of the Foundation and the International Health Board in London in the early summer. Later a request was made by the British Ministry of Health for the co-operation of the Foundation. This was considered by the Board and negotiations were authorized.

The Rôle of the Nurse in Cure and Prevention

The modern hospital and doctors and surgeons are largely dependent upon the trained woman nurse, who has made an invaluable contribution to curative medicine. Public health administrators are recognizing the visiting or health nurse as equally indispensable to the success of public and personal hygiene. Already maternity and child welfare nurses, school nurses, tuberculosis nurses, and several other specialized types have taken their places in private health systems and in government departments. One state has announced as its goal the appointment of a health nurse for every 2,000 of the population; another has fixed the ratio at one to 3,000.

Questions as to the exact function of the bed-

side nurse, the kind and length of training she should receive, have been under discussion for some time. The advent of the health nurse raises similar problems. How far should her education coincide with that of the hospital nurse? In what should consist her special training? How much time should the entire course occupy? Should there be different grades of both bedside and health nurses? Are there place and function for a lay worker or a health-visitor? In 1919 the Foundation invited a group of persons who are most familiar with nursing problems to a conference which nominated a survey committee under whose auspices a competent expert has been making a study of the subject in all its phases. A report is promised in the summer of 1922. The expenses of the survey have been met by the Foundation.

During 1921 the International Health Board contributed toward short courses for New York State nurse training. Four nurse training centers in France were aided not only to train *visiteuses d'hygiène* but to improve in certain hospitals standards of ward nursing and administration. The Cavell-Depage Memorial School of Nursing in Brussels will be an integral part of the reorganized hospital and medical school to which the Foundation is contributing a large sum. The International Health Board is

co-operating with the government of Brazil in developing a public health nursing service. The Foundation supports a nurse training school in connection with the Peking Union Medical College. A survey of nurse training in Great Britain and on the Continent, to be begun early in 1922, has been authorized. Scholarships were granted to four Polish nurses for study and training in the United States.

Medical Service at Moderate Cost

A modern clinic may serve the interests of both preventive and curative medicine. Persons may resort to it to make sure that they are well or to have their diseases recognized and treated. Diagnostic and treatment facilities are now available in cities and large towns for the rich and well-to-do and for the very poor, but self-respecting people of small means are too often at a loss for good medical aid. It is true that the leading consultants and specialists make concessions in individual cases but this generous attitude of the profession solves only a minute part of the problem. The tendency to establish medical group clinics makes it easier to provide modern facilities at lower cost, but at best the fees are considerable, and many people hesitate to ask for a concession in charges. Hence the demand for a pay clinic for persons with small incomes.

An experiment in meeting this demand was begun by the Cornell University Medical School in New York City in November, 1921, with the co-operation of a special committee of the United Hospital Fund. The work of this committee, which is helping to improve standards of dispensary management and service, is supported by the Rockefeller Foundation. The initial deficit of the Cornell clinic demonstration, which is expected to become self-supporting, was underwritten by this committee.

The essentials of the plan are: (1) medical, surgical, and specialist service by well-trained young doctors, who are paid for their work, (2) supervision by the college faculty, (3) instruction of medical students in the clinic, (4) appointments with patients made by telephone or post to avoid waste in waiting, (5) clinics, in addition to day sessions, open two evenings a week for the convenience of patients employed during the day, (6) a charge of $1.00 for each call, laboratory examinations and X-ray plates at cost, a complete diagnostic examination for patients referred by physicians for an inclusive fee of $10.00. On the day the clinic opened 700 persons presented themselves. There has been a steadily growing patronage ever since. An increasing number of doctors have brought patients for diagnosis and consultation. It is too early to assert that

clinics of this kind will satisfactorily solve the problem, but experience so far has been distinctly significant and encouraging.

A Medical Center Opened in Peking

On September 19, 1921, in the capital of China a unique academic procession made its way through oriental corridors and courts to an assembly hall which in its exterior form and decorations reproduced the classic features of Chinese architecture. The cortège was a blending of East and West. Chinese officials and other leading citizens, some of them in national dress, members of the diplomatic corps, distinguished guests in the variegated brilliant gowns and hoods of European and American universities, the officers, trustees, and faculty of the Peking Union Medical College, all in academic garb, made a striking and symbolic picture. Brief words of greeting and appreciation from representatives of the President of China, the Cabinet, the medical profession and educational institutions, a statement by the Director of the China Medical Board, an address on the aims and spirit of the College by the Chairman of the Board of the Rockefeller Foundation, and the institution in its new setting and with enlarged resources was rededicated to the service of the Chinese people.

These simple ceremonies were one session of a

program which extended over an entire week and included daily clinics, scientific papers on medical and public health themes, popular evening addresses, sight-seeing excursions, a garden party at the Summer Palace, a reception by the President of China, dinners and receptions at the American and British legations. In addition to a score of special guests of the Foundation from England, France, Ireland, Canada, Japan, China, the Philippines, Hong Kong, and Java, more than three hundred medical and educational delegates, Chinese and foreign, were in attendance on what was actually an international congress of curative and preventive medicine. The clinics and papers were rated by competent judges as highly scientific and significant. The contributions of the members of the Peking faculty made a most favorable impression upon the visiting scientists.

The buildings of the College were admired both for their architectural beauty and for their practical serviceability and complete equipment. All the essential laboratories and lecture rooms, a hospital of 225 teaching beds, and an outpatient department, are provided. The entire plant comprises for purposes of instruction, for faculty and student quarters, for mechanical services and storage, an area of about twenty-five acres and a total of fifty-nine buildings. It was neces-

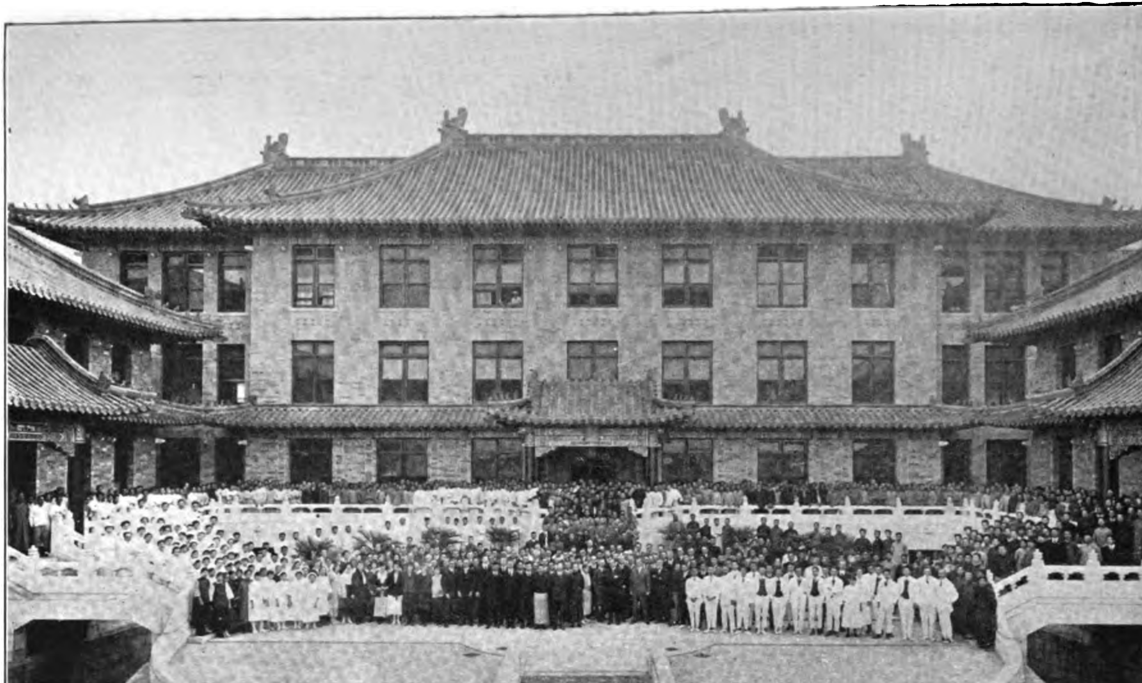


Fig. 8.—Staff and students of the Peking Union Medical College, September, 1921. Picture taken in the forecourt of hospital. Left to right: nurses, administrative staff, faculty and hospital interns; to right on steps, students; in background, laboratory assistants, hospital attendants, service workers, janitors, cleaners, cooks, laundrymen, gate-keepers, guards, and servants

Fig. 9.—Academic procession at dedication of the Peking Union Medical College

Fig. 10.—Part of academic procession, dedication of Peking Union Medical College, September 19, 1921. From right to left: Dr. W. W. Yen, Minister of Foreign Affairs; Mr. Roger S. Greene, Director of the China Medical Board; Dr. H. S. Houghton, Director of the Peking Union Medical College; Mr. John D. Rockefeller, Jr., Chairman of the Board of Trustees of the Rockefeller Foundation

sary not only to build a medical school and hospital but to add to them the housing, water supply, sewerage, electric light, and fuel gas services of a modern community. The cost of construction was enormously increased by the war. Prices soared, freight rates rose, silver so increased in value that at one time a gold dollar would purchase slightly less than one silver dollar instead of the normal two.

On June 30, 1921, the teaching staff of this Peking center numbered sixty-seven, of whom seventeen were instructors in the pre-medical school. About one fourth of the total teaching corps were Chinese, almost all of whom were trained in the United States or Europe. Besides the educational personnel there were fifteen hospital interns and residents, twenty-eight nurses, twenty-nine members of the business and administrative departments, twenty-two secretaries, eleven technicians, librarians, and others. The service group of assistants, attendants, messengers, cooks, waiters, stokers, janitors, totaled 601, practically all Chinese. The student registration for 1921–1922 showed fifty-two in the pre-medical school, twenty in the medical school, and eleven in the nurses training school. For the previous year forty-nine advanced students were registered for graduate and special courses. This number is likely to be exceeded

during the current session. The total number of students for the year will approximate 140. The fact that only a small number of preparatory schools and colleges can meet the entrance standard, the length and cost of the medical course, the popular ignorance of modern medicine, are obstacles to be slowly overcome. In all the circumstances the present numbers are distinctly encouraging.

The College seeks quality rather than quantity. It aims not to turn out numerous doctors —Chinese institutions must assume this task— but to train leaders who may serve as teachers and investigators in Chinese medical schools, hospitals, and health organizations. In its own work it proposes to develop Chinese teachers, who already constitute 25 per cent of the teaching staff, and to give them increasing rank and responsibility as rapidly as they are prepared to assume them. The officially announced purposes of the Peking Union Medical College are: to conduct a high-grade medical curriculum for undergraduates, to provide graduate training for laboratory workers, teachers, and clinical specialists, to offer short courses for physicians, to furnish opportunities for research, especially in diseases peculiar to the Far East, and incidentally to extend the popular knowledge of modern medicine and public health among the Chinese.

The trustees devoted a week in Peking to detailed consideration of the problems of the College and adopted a policy which calls for: (1) gradual growth rather than rapid expansion, within (2) budget limits fixed for three years at not more than $1,200,000 silver (about $700,000 gold), per annum, (3) the gradual transfer of the responsibility for pre-medical education to other schools and colleges, (4) the training of Chinese men and women to assume, as fast as they show the necessary capacity, increasing responsibility for teaching, investigation, and administration, (5) the encouraging of Chinese co-operation in the increasing of clinical facilities by establishing under Chinese auspices special dispensaries and hospitals, (6) a steady effort to enlist the interest and secure the aid of public-spirited Chinese in interpreting the purposes of the college to the Chinese people.

In addition to their regular duties members of the faculty of the College during the year participated in famine relief, worked out a food ration as a basis for distribution of food to famine sufferers, provided medical consultation service for a Chinese orphanage, visited many educational institutions to give expert counsel about apparatus and X-ray equipment, organized typhus-prevention squads to protect the refugee camps and the city of Peking, rendered a large amount

of private medical and surgical service the fees for which went into the treasury of the College, assisted in archeological research, and in many other ways entered into the life of the capital and the country.

The China Medical Board, under whose auspices work in China is administered, in addition to completing and maintaining the College in Peking, authorized a survey of pre-medical education, contributed to the expenses of a commission sent by a group of missionary societies to study and report upon education under missionary auspices in China, made appropriations to a language school and a school for foreign children in Peking, contributed to a dental clinic in return for service to the college hospital, gave maintenance funds to two mission medical schools, made a small gift to a Chinese medical school, continued appropriations which had been pledged to five pre-medical schools, seventeen hospitals, and to a committee for translating medical books into Chinese, and awarded fellowships for study in the United States.

Medical Education in Many Lands

Columbia University in behalf of its medical school has made an arrangement with the Presbyterian Hospital by which on a new uptown site in New York a combined medical school

and hospital group will be built. This will be one of the most complete and best equipped medical centers in the world. Toward the sum needed for building operations and increased maintenance the Foundation agreed to contribute $1,000,000.

During 1921 contracts were signed with the University of Brussels, the Hospital Board of Brussels, and the municipality itself, by which the Rockefeller Foundation agreed to give $3,500,000 toward the cost of concentrating upon one site and completely rebuilding the medical laboratories and the antiquated hospital of St. Pierre. The Cavell-Depage Memorial Nurses' Home and Training School will be an integral part of the project. The new buildings designed by a leading Belgian architect will constitute the most modern and convenient medical training plant in Europe.

In further distribution of the $5,000,000 set aside in 1920 to aid medical education in Canada the following sums were voted during 1921: to Dalhousie University to meet an emergency which arose in connection with a maternity hospital, $50,000; to the University of Montreal medical school for strengthening pre-medical science teaching, $25,000; to the University of Alberta for clinical instruction, $25,000. The pledge of $1,000,000 to McGill University was paid.

During the year the Foundation supplied the funds by which thirty-eight medical centers in Central, Western, and Southern Europe received current numbers and back files of the principal journals of the medical sciences published in English. Without this aid it would have been impossible in view of present rates of exchange for these institutions to secure any considerable number of these important publications. In addition to the $100,000 voted in 1920 for apparatus and supplies sorely needed by five universities in Central Europe, an additional sum of $50,000 was last year appropriated for the same purpose.

With the aim of gathering accurate data about medical education in many countries, representatives of the Foundation made surveys of medical schools in Japan, China, Hong Kong, the Philippines, Siam, Indo-China, Straits Settlements, Java, Egypt, Syria, and Constantinople. Less thorough studies were made of several schools in India.

Envoys of Science and Education

Bacon in the *New Atlantis* describes an ideal commonwealth based upon scientific research and the application of its results to the life of the people. One of the officials in explaining the organization of the staff to foreign visitors, says: "For the several employments and offices

of our fellows, we have twelve that sail into foreign countries . . . who bring us the books and abstracts, and patterns of experiments of all other parts. These we call merchants of light." Bacon saw that science suffers not only from provincialism but from nationalism. The search for truth and its application to human need is a vast, world-wide co-operative task which demands constant interchange of ideas and more intelligent team-work among workers. Every country should seek entangling alliances in a league for scientific progress.

During 1921 the Foundation made a contribution to world commerce in ideas. Its own representatives visited Europe, the Near East, the Far East, India, and South and Central America. Resident directors of health demonstrations were maintained in twenty-three foreign countries. From all these men and women came reports, memoranda, and printed matter which enriched the files of the central office and supplied ideas and suggestions, many of which will be at the disposal of individuals and institutions in this and other countries.

At the invitation of the Foundation individuals and groups visited the United States and Great Britain as envoys of science, "merchants of light." Two heads of departments in University College Hospital Medical School, London, made

a tour of the leading medical schools of the United States and Canada. The executive secretary of the Medical Research Council and the chairman of the Medical Division of the University Grants Committee of Great Britain followed much the same itinerary. The president of the hospital board of Brussels and the architect of the new medical buildings visited England and the United States to study the architecture and administration of hospitals and laboratories. Clinical professors of the Brussels University Medical School spent some time in London to observe the operation of full-time *units* in medicine and surgery and the use of outpatient departments in teaching. A Serbian Commission visited the United States and England to familiarize its members with methods of medical education and of public health administration. A noted Brazilian physician, the Director of the National Department of Health and of the Oswaldo Cruz Institute, came with one of his colleagues to visit medical schools and to study public health laboratories and practical field methods.

Student Fellows from Eighteen Countries

One hundred and fifty-seven individuals during 1921 held fellowships, funds for which were directly or indirectly supplied by the Rockefeller

Foundation. These fellowships fell into five groups: (1) fifty-four fellowships in public health under the International Health Board, (2) fifty-two fellowships administered by the China Medical Board, (3) sixteen fellowships in medical education, (4) thirty-four research fellowships in physics and chemistry supervised by a special committee of the National Research Council, and (5) one member of the International Health Board staff who, on what is known as "study leave," was engaged in special study. The distribution of these fellows by countries was: seventy-one Americans, one Belgian, seven Brazilians, eleven Canadians, one Singhalese, seventeen Chinese, one Colombian, two Costa Ricans, nineteen Czechs, seven British, four French, one Guatemalan, one Mexican, two Nicaraguans, seven Poles, two Salvadoreans, two Syrians, one Norwegian.

The increase in the number of Foundation fellowships during the last few years is significant. In 1917 there were sixty-one; by 1919 the list included eighty-four; in 1920 there were 120; the maximum for 1921, as has been already indicated, was 157. This rapid multiplication of fellowships reflects the conviction that the training of men and women for leadership and for technical efficiency is fundamental to progress in preventive medicine and in medical education. Fellow-

ships are granted only to persons of exceptional promise who declare their intention of entering institutional or governmental service. Explicit official assurances that posts will be available when the training has been completed are also required. The plan is beginning to show encouraging results. Already a number of former fellows are occupying positions of responsibility in their own countries.

The fellowships, which are administered directly by the Foundation and its agencies, are supervised by a special officer who gives most of his time to corresponding with candidates, conferring with newly arrived fellows, advising them about institutions and professors, helping them to arrange their plans of study, visiting them from time to time in the cities where they are at work, conferring with the men under whom they are studying, securing periodic reports of progress, dealing with emergencies, arranging for special excursions, and in other ways seeking to insure the most fruitful use of the opportunities which the fellowships are designed to provide.

Yellow Fever in Retreat

The salient facts about yellow fever may be summarized as follows: probably prevalent in Aztec times in Mexico and Central America; for last two centuries a dreaded scourge in Mexico,

the West Indies, Central and South America, frequently invading North American ports and causing thousands of deaths in the lower Mississippi valley; fact of transmission by bite of female Stegomyia mosquito established by American Army Medical Commission under Reed in Cuba, 1900–1901; Havana and Cuba freed from fever by Gorgas, who organized anti-mosquito measures, 1901–1902; example followed in Rio de Janeiro and Vera Cruz, 1903–1909; Panama Canal Zone successfully protected by same methods, 1904–1906; fear that canal traffic might carry disease to Far East and the confidence of Gorgas that fever could be eliminated led to appointment in 1916 by International Health Board of special commission to survey seed-beds of infection; Gorgas, head of commission, recommended a campaign of extermination; during delay caused by war, Noguchi of Rockefeller Institute for Medical Research visited Ecuador, Peru, and Yucatan, isolated germ believed to be inciting cause of yellow fever, and prepared vaccine and serum, 1918–1920; yellow fever commissions organized in Central American countries, Colombia, Venezuela, Ecuador, and Peru; intensive campaign, 1918–1919, under Connor eliminated disease from Guayaquil, the chief endemic center; 1920, commission sent to West Coast of Africa to investigate suspected areas; with oc-

casional outbreaks, most of them traceable to places in Southern Mexico, the fever gradually gave ground; late in 1920 Mexican government organized commission and invited co-operation of International Health Board.

Up to the beginning of 1921 experience with Noguchi's vaccine and serum indicated that the former when properly administered affords a marked protection against attacks of yellow fever, and that the latter if it is used on or before the third day of the onset of the disease reduces the mortality in a striking way. Data reported during last year confirm these conclusions. In Peru, of a group of fifty non-immune soldiers who were being sent into an infected district, twenty-five were vaccinated and twenty-five were left unvaccinated. Twenty of the latter group contracted yellow fever, while no case of the disease occurred among members of the former. Of twelve yellow fever patients in Belize, Honduras, who were treated with serum on or before the third day of the attack, eleven recovered. Until yellow fever is eradicated at its sources, the vaccine and serum promise to be most valuable means of prevention and cure.

With the entrance of the Mexican government early in 1921 into the yellow fever campaign the prospects of successful advance brightened. The chief remaining sources of infection were at-

tacked. During 1921 Ecuador, Honduras, Nicaragua, and Costa Rica were not invaded by the disease. Guatemala reported no case after February 2; Salvador's last case was recorded February 15; by July 16 Peru was free, as was British Honduras in November. From Northern Brazil cases were reported but the situation was being dealt with by the government. It was gratifying to the Foundation to be able to advance money for continuing the campaign in Peru at a time when government funds were not quickly available. The advantages of having resources which could be immediately mobilized in an emergency were strikingly demonstrated. It was another example of the efficiency of a unified plan of co-operation. The outlook is encouraging; it is too early to proclaim a complete victory, but the purpose to push the fight against yellow fever remains steadfast.

Howard B. Cross on the Honor Roll of Science

Dr. Jesse Lazear, one of the Army commission in Cuba, gave his life for science and his fellow men as the direct result of his studies of yellow fever. Such courage knows no stimulus of dramatic excitement, of martial music, of stirring battle charge. The list headed by Lazear, of brave men and women who have died in investigating yellow fever or in car-

ing for its victims, is a long and noble roll of honor.

To this roll has been added during recent months the name of Howard B. Cross, of the staff of the Rockefeller Institute for Medical Research, who, after special work with Noguchi, went to Mexico under the auspices of the International Health Board to assist in the diagnosis of doubtful and complicated cases of genuine or suspected yellow fever. He sailed from New York November 23, landed at Vera Cruz, fell ill in the village of Tuxtepec December 18, and returned to Vera Cruz, where he died of yellow fever December 26, 1921.

The Mexican authorities and the Mexican medical profession did all in their power to show their sympathy and admiration. The utmost courtesy and consideration were manifested. By formal resolutions, guards of honor, and other evidences of respect and appreciation, their good will and gratitude were warmly expressed. The public health laboratory of Vera Cruz has been named the Howard B. Cross Laboratory.

Dr. Cross, born in 1888, was graduated from the University of Oklahoma, served as instructor in zoology for two years, was a graduate student at the University of Chicago and at Johns Hopkins University. In 1917 he married Miss Ollie DeBoard. In June, 1921, he received the degree

of Doctor of Philosophy from the latter institution, where he had specialized in bacteriology. In 1918 Dr. Cross had enlisted in the United States Army Medical Corps and was assigned to the Johns Hopkins Medical School for special investigative work.

This young American, well-trained, devoted to the search for truth, loyal to a great cause, died gallantly in combating a dread plague. By his death science has lost an able and conscientious worker, and the world a brave and generous spirit.

Continued Demonstrations in the Control of Malaria

The primary object of the International Health Board and the allied Federal and state health organizations in undertaking malaria work in 1916 was to prove to small towns, villages, and rural communities that malaria can be practically eradicated at per capita costs which make elimination cheaper than harboring the disease. The campaigns were based upon two scientific facts: (a) malaria can be communicated only by the bite of the Anopheles mosquito, and (b) almost all sufferers from malaria can be cured by the administration of quinine in proper doses over a sufficient period of time. The prevention of mosquito breeding by drainage, by

surface oiling of standing water, by the use of fish which eat the mosquito larvae; the protection of people by screening beds and houses, by removal of houses from the vicinity of breeding places, by the killing of adult mosquitoes; the use of quinine when mosquito control is too difficult, have been tried in various combinations, most

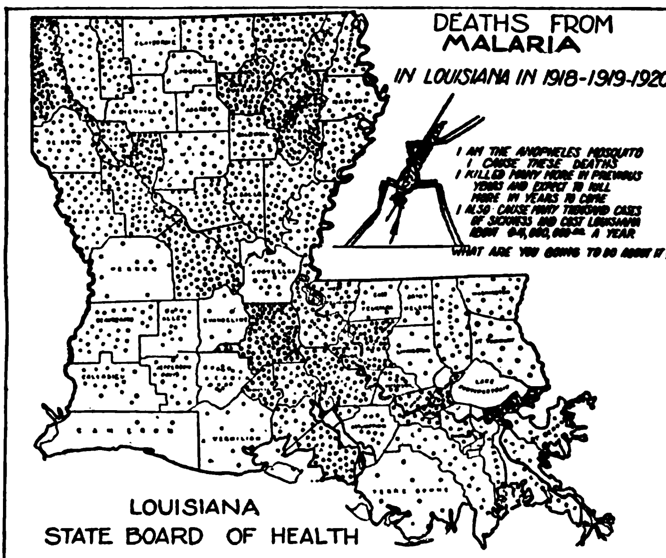


Fig. 11.—Map used in anti-malaria campaign in Louisiana. Each dot represents a death from malaria. The public health importance of malaria, however, is more accurately measured by the sickness rate and the loss of efficiency than by the loss of life. It has been estimated that for each death 2,000 to 4,000 days of sickness must be included in the total burden of loss and suffering caused by the malaria mosquito

of them with a success that has been strikingly convincing.

For the past two years demonstrations have been carried on in conjunction with local authorities, state boards of health, and the United States Public Health Service. During 1921 in nine southern states new demonstrations were undertaken in twenty-six localities, while supervision of work previously inaugurated was continued in thirty-five places in ten states. Reports indicate that substantial reductions in the prevalence of the disease were effected at an average per capita cost of $1.01. Reductions secured by demonstrations made in 1920 were maintained at an average cost of $.25 per capita.

Investigations as to the adaptation of anti-malaria measures to tropical conditions were started in Porto Rico and Nicaragua. Preliminary studies were also made in Argentina and elsewhere to discover variations in conditions to be dealt with. Experiments in treatment by quinine were concluded in Sunflower county, Mississippi, where by experimental methods a standard dose of this drug calculated to protect individuals had previously been worked out and has now been made available to the public through commercial channels at a cost of $1.95.

In addition to continued investigations in various methods of mosquito control, including the

use of fish, surveys were undertaken in two regions in the South to determine the prevalence of malaria and the part which it plays in impairing the health and efficiency of a given population. One report for an area in Southeast Missouri was completed and confirms the belief held by many that this disease, although less severe than in former years, is still a crippling malady which not only impairs vitality, increases suffering, depresses the community spirit, but adds directly and substantially to the death rate.

The Hookworm Story of One County

In the spring of 1910 a hookworm survey was made of the school children of a Virginia county. This study showed that 82.6 per cent of the pupils were infected, and there was reason to believe that a high percentage prevailed in the population as a whole. There were plenty of external evidences of the malady. Individuals were pale, listless, and weak. Many were bed-ridden. The rich soil ill-cultivated produced a bare living. School attendance was small and the children who were enrolled made little progress. Local institutions languished; social life was primitive, community spirit lacking, moral standards low. The people were carrying a crippling load. Greedy parasites were robbing their blood. A polluted soil was maintaining the vicious circle of infection.

The Rockefeller Sanitary Commission, later merged in the International Health Board, began at once in co-operation with the Virginia State Board of Health an anti-hookworm campaign under the leadership of a devoted and able local physician whom the people knew and trusted. Clinics were organized, the cause, cure, and prevention of hookworm disease were explained to the public, curative drugs were administered, sanitary conveniences were introduced. Fifteen months later a second school survey showed that the infection had been reduced to 35.2 per cent. The changes in the life of the community were unmistakable. The glow of health had come to once pallid faces, chronic invalids had returned to active work, farms gave larger returns, the school enrolment had increased, pupils were alert, new energy and spirit manifested themselves in neighborly contacts and co-operation. But the work was not abandoned. Vigilance was continued and to good purpose, for a third survey made in 1921 showed the almost negligible infection of 2.2 per cent. In a little more than a decade a radical transformation had occurred.

Resurveys of many other counties scattered through the Southern States were made during 1921. The results were gratifying and encouraging. They showed what can be accomplished by

persistent attacks upon one widely prevalent disease. They will spur the health authorities to renewed effort on a broader scale. Aid in the control of hookworm disease was given by the International Health Board to governments in eighteen different countries in South and Central America, the West Indies, India, Ceylon, Borneo, Siam, and Australia. In almost every case the authorities assumed during the year a larger share of the cost. Investigations were also continued into the nature and spread of hookworm disease.

Hookworm Broadens into Health Service

The process of widening hookworm work into general county health services made rapid progress during 1921. The International Health Board in ending its specific campaign participated in the broader programs which were carried out in eleven southern states. Before the end of the year arrangements had been made to aid similar undertakings in seven other states. Last year 192 counties in the United States were conducting health services under full-time health officers. To the health budgets of seventy-seven of these counties the Board contributed on the average one fourth of the cost. The development of county health work in Brazil is a gratifying outgrowth of the hookworm campaign in which the

International Health Board had been participating.

County health measures obviously vary with the local conditions. Attacks must be made upon diseases in the order of their importance. Costs must be kept within the limits of the funds available. In the circumstances the plans are necessarily fairly simple and inexpensive. The average campaign includes: vaccination against typhoid and smallpox; diphtheria prevention; the building of sanitary fly-proof latrines; medical inspection of school children, with dental and tonsil clinics; infant and maternal welfare work; control of communicable diseases in general, including special attention to tuberculosis, and popular education in public and personal hygiene.

The following is an estimate of the annual cost of a full-time health administration in an average county: salaries—county health officer $3,000, sanitary inspector $1,500, nurse $1,500, clerical assistant $900; traveling expenses for these persons $2,400; contingent fund $700; total $10,000. While contributions from outside sources seem to be necessary at the outset it is believed that fairly prosperous counties should be able to meet by taxation the entire cost of this simpler type of health service. An extension of the program might call for continued state and Federal aid to supplement local funds.

Tuberculosis Campaign in French Hands

The special Commission which in 1917 was sent to France under the auspices of the International Health Board to aid in the creation of a nation-wide anti-tuberculosis organization was formally disbanded June 30, 1921. Certain special representatives of the Board remained in France to complete arrangements for the final transfer to French agencies, governmental and private, of the functions which the Commission had been performing. These activities were of four kinds: (1) medical, including demonstration dispensaries and graduate courses for physicians, (2) training of public health visitors, (3) education of the public, (4) organization of departmental and local committees.

Systems of tuberculosis clinics established by the Commission in the nineteenth arrondissement of Paris and in the department of Eure-et-Loir have been transferred, together with certain sums of money, to the municipal and departmental authorities. The number of dispensaries established throughout France since July, 1917, and modeled upon these demonstration centers, has reached a total of 373, a substantial proportion of the total number estimated as necessary to give the nation an adequate system upon which to base an inclusive program of early

diagnosis, health visitors, preventoria, sanatoria, special relief, and individual and public education.

From training schools aided by Foundation funds, 249 health visitors have been graduated. Some of these women are serving as departmental supervisors; others are working in local dispensaries. The length of the training course has been extended from six to ten months. Some schools are now requiring two years. Scholarships both for physicians and nurses in training have been provided by the Board in large numbers. Salaries for supervising and other visitors have also been paid from the same source. Responsibility for these forms of aid is being transferred steadily to the French.

Active educational propaganda by means of traveling exhibits, school exercises, public meetings, groups of lecturers, films and stereopticon slides, posters, pamphlets, newspaper articles, et cetera, has been carried on in fifty-four of the ninety-three departments of France. Motor cars, and more recently a special railway carriage, have been utilized. This function is being gradually handed over to the Comité National, a French society for combating tuberculosis. It is proposed to create under the auspices of the Comité a bureau by which literature will be issued for distribution through departmental and local

committees. For a time the Board will continue to support two traveling educational units.

As a result of initiative of the Foundation's Commission eighty-eight departmental committees and over 350 local committees have been formed. It is these groups which help to organize and support dispensaries and to promote other features of the plan. While the Board will not extend this organization work to other departments, it will in certain places give counsel and aid, seeking to improve organizations and to secure appropriations from departmental and city treasuries. This task of organization is being assumed more and more by the Comité National, to which, next to the Ministry of Hygiene, the Board looks for the continuation and extension of the anti-tuberculosis movement in France.

This project represents the only effort of the International Health Board in the field of tuberculosis. It was undertaken as a form of war-time, emergency aid. There is no intention of doing similar work in other countries. The Board had no thought of providing a complete system for combating the white plague. It did not assume responsibility for hospitals, sanatoria, or direct relief. The American Red Cross during the war made generous appropriations for these purposes. The aim of the International Health Board was to demonstrate a system of organiza-

tion, of special training, of popular education, of extension methods. It hoped to stimulate government and voluntary agencies to adopt this system on a national scale and to support it as adequately as circumstances would permit. Everything considered, the response of the French people has been remarkably gratifying. Up to the end of 1921 the Board had spent upon this French campaign about two million dollars.

Consultation Service and Field Studies

During the year 1921 officers and special representatives of the Rockefeller Foundation and its agencies gave counsel to twelve state and national governments about health laboratory administration, made recommendations to medical school authorities in the Far East, conferred with officials of the British government concerning the problem of training health officers, lent a public health administrator, a sanitary engineer, and an industrial hygienist to the Australian Ministry of Health, contributed toward the salary and supplies of a pathologist in the São Paulo Medical School, Brazil, and in other ways made information and suggestions available for public authorities, educational institutions, and voluntary health agencies.

In addition to the scientific investigations of hookworm disease, malaria, and yellow fever

which have already been mentioned, the Foundation supported studies of pre-medical education in China, of nurse training, of dispensary development, of hospital administration, and the training of hospital executives. Surveys were also made of leading medical schools and hospitals in Japan, Manchuria, China from Peking to Hong Kong and from Shanghai to Changsha, the Philippines, Straits Settlements, Siam, and Indo-China. In connection with public health inquiries a representative of the International Health Board visited medical schools in Constantinople, Beirut, Cairo, Bombay, and Calcutta.

In the routine investigation of projects which ask for Foundation aid a large amount of valuable data is accumulated in the office files and library. This material forms a growing body of significant information about various movements and institutions most of which are more or less closely related to public health and medical education. For example, during 1921 a special visit was made to the Marine Biological Laboratory at Woods Hole, Massachusetts, upon the organization and work of which a report was prepared.

Sundry Items of Aid and Service

For twenty years, under the name of the *Concilium Bibliographicum*, the late Dr. Herbert

Haviland Field maintained in Zürich, Switzerland, a bureau of bibliography which provided printed library cards and bound volumes of references in certain of the biological and medical sciences. During the war this institution was so seriously crippled that its continuance seemed impossible. Pending a study of the problem of international bibliographical service, the Foundation gave temporary aid. During the year 1921 the National Research Council of the United States made an investigation and decided in conjunction with a Swiss society to assume responsibility for the *Concilium*. Toward capital costs and for a three-year period of maintenance a further contribution was made by the Foundation.

A council of associations which are interested in hospital development has established in Chicago a hospital library and service bureau. This collects all kinds of significant information about hospital planning, equipment, personnel, and administration. This clearing house furnishes to boards of trustees, executives, and others, authoritative reports on various phases of the hospital problem. While attention has at first been centered on the situation in the United States, the scope of the work is being gradually extended to include other countries. The Foundation has contributed to the maintenance of this bureau.

The American Medical Association prints a Spanish edition of the *Journal of the American Medical Association* which circulates in Mexico, Central and South America, Spain, and the Philippine Islands. This edition so obviously contributes to a wider knowledge of modern medicine and to a better understanding between the United States and Spanish-speaking nations that the Foundation has been ready to share with the Association the burden of the deficit which is involved in its publication.

In answering the large number of letters from correspondents the officers of the Foundation and its Boards try so far as feasible to supply useful information and to offer practical suggestions. It is often possible in this way to render service even when, as is so generally the case, no financial aid can be given.

Applications for Aid

Table 1, covering the requests for aid made during the year 1921, shows that 721 formal applications were dealt with by the Foundation. There were, besides, a large number of tentative inquiries which never reached the stage of official requests. The statistics reflect the policy of concentration, for the present at least, upon fundamental projects of medical education and public health.

TABLE 1: APPLICATIONS FOR AID RECEIVED AND ACTED UPON DURING 1921

CLASSIFICATION OF APPLICATION	RECEIVED	GRANTED	DECLINED	PENDING
1. Public Health	56	7	49	
2. Medical and nursing education and subsidization of medical research (including granted fellowships)	132	41	86	5
3. General education (including educational projects and research other than medical)	71	3	67	1
4. Foreign relief or reconstruction	21		21	
5. National movements in fields other than 1 and 2	8		8	
6. Campaigns to influence public opinion	16		16	
7. Local churches and institutions	163		163	
8. Personal aid (including loans, gifts, medical treatment, education)	128		128	
9. Financing or promotion of books, plays, inventions, etc.	37		36	1
10. Investigation, reward, or purchase of alleged medical discoveries	51		51	
11. Miscellaneous	38	1	37	
TOTAL	721	52	662	7

Finances for 1921

Table 2 gives a summary of receipts and expenditures for the year 1921.

The income from invested funds was nearly eight millions and three quarters. A balance of six millions was carried over from 1920, of which four millions had been pledged. Likewise a balance of seven and a third millions was carried forward into 1922, of which six and a quarter

millions had been pledged. Tables on pages 82 and 83 present a summary of expenditures in 1921 for all purposes. The total outstanding obligations of the Foundation, December 31, 1921, including appropriations already due, and appropriations and pledges payable in 1922 and future years, were $23,219,394. The aggregate expenditures of the Rockefeller Foundation from the time it was chartered in 1913 up to December 31, 1921, were $61,081,775. Thus, during its existence the institution has disbursed, appropriated, or pledged a total sum of $84,301,169.

TABLE 2: RECEIPTS AND DISBURSEMENTS IN 1921

RECEIPTS		EXPENDITURES		
Balance from 1920..	$6,204,316	Public Health......		$2,123,820
Refunds on appropriations.............	82,353	Medical Education .		4,111,667
Income during 1921..	8,702,690	Food Relief— Europe		1,000,000
		Miscellaneous......		224,748
		Administration.....		170,123
				$7,630,358
		Balance		
		Payable on 1921 and prior year appropriations	$4,032,998	
		Available for 1922 appropriations	3,326,003	7,359,001
	$14,989,359			$14,989,359

Team-Work for World Health

The outlines of a world-wide campaign for health are beginning to emerge. Scientific research workers in many national centers are in

constant communication. Knowledge is being applied more effectively to the problems in the field. Governments are sending attachés of hygiene into each other's territories. Vital statistics on an international scale are being reported more accurately. Prompt notification of epidemics is being facilitated. Outposts against plague and other diseases are being stationed and supported. Leaders and technical experts are in training in larger numbers and under more favorable conditions. Fundamental medical education is becoming more thorough and more cosmopolitan. Popular knowledge about preventive medicine and personal hygiene is increasing. Intercommunications of many kinds are being improved and multiplied. All these things are fostered by many methods and agencies such as working agreements between governments, the Health Committee of the League of Nations, and the League of Red Cross Societies. It is the purpose of the Rockefeller Foundation and its Boards to have a part in this world-wide team-work for preventing disease and bringing about improved conditions of health, and thus "to promote the well-being of mankind throughout the world."

THE ROCKEFELLER FOUNDATION

Report of the Secretary

THE ROCKEFELLER FOUNDATION

Report of the Secretary

To the President of the Rockefeller Foundation:

Sir:

I have the honor to submit herewith my report on the activities of the Rockefeller Foundation for the period January 1, 1921, to December 31, 1921.

Respectfully yours,

EDWIN R. EMBREE,

Secretary.

SECRETARY'S REPORT

The review by the President outlines the policies by which the Rockefeller Foundation is being guided in its work, sketches its present program, and describes the results aimed at and accomplished during the year 1921. The following report depicts the organization and the agencies through which these results were reached, and outlines the methods by which the programs of the several departments were carried out.

Organization

The following are the members and officers of the Rockefeller Foundation for 1922:

MEMBERS

John G. Agar	Vernon Kellogg
Wallace Buttrick	John D. Rockefeller
John W. Davis	John D. Rockefeller, Jr.
Simon Flexner	Wickliffe Rose
Raymond B. Fosdick	Julius Rosenwald
Frederick T. Gates	Martin A. Ryerson
A. Barton Hepburn[1]	Frederick Strauss
Harry Pratt Judson	George E. Vincent

EXECUTIVE COMMITTEE

George E. Vincent, *Chairman*

Wallace Buttrick	Vernon Kellogg
Raymond B. Fosdick	Wickliffe Rose

Edwin R. Embree, *Secretary*

[1] Deceased.

OFFICERS

John D. Rockefeller, Jr.	*Chairman Board of Trustees*
George E. Vincent	*President*
Edwin R. Embree	*Secretary*
Norma F. Stoughton	*Assistant Secretary*
L. G. Myers	*Treasurer*
L. M. Dashiell	*Assistant Treasurer*
Robert H. Kirk	*Comptroller*
Chase Andrews	*Assistant Comptroller*
Frank S. Staley	*Office Manager*
C. C. Williamson	*Director of Information Service*

The Foundation holds regular meetings in February, May, and December. The executive committee meets frequently during the intervals to execute programs within general policies approved by the Trustees. Twenty-two meetings of the Executive Committee were held during 1921.

Departmental Agencies

The Foundation accomplishes its work largely through departmental organizations that are devoted to special functions, and depend upon the Foundation for funds. These with their officers and members are:

INTERNATIONAL HEALTH BOARD

George E. Vincent, *Chairman*

Hermann M. Biggs	Vernon Kellogg
Wallace Buttrick	T. Mitchell Prudden
Simon Flexner	John D. Rockefeller, Jr.
Raymond B. Fosdick	Wickliffe Rose
Frederick T. Gates	Victor C. Vaughan
Edwin O. Jordan	William H. Welch

Edwin R. Embree, *Secretary*
Florence M. Read, *Assistant Secretary*

Wickliffe Rose	*General Director*
John A. Ferrell, M.D.	*Director for the United States*
Victor G. Heiser, M.D.	*Director for the East*
H. H. Howard, M.D.	*Director for the West Indies*
F. F. Russell, M.D.	*Director of Public Health Laboratory Service*

CHINA MEDICAL BOARD

George E. Vincent, *Chairman*

Wallace Buttrick	Vernon Kellogg
Simon Flexner	Harry Pratt Judson
Raymond B. Fosdick	John R. Mott
Frederick L. Gates	Francis W. Peabody
Frank J. Goodnow	John D. Rockefeller, Jr.
Roger S. Greene	Wickliffe Rose

William H. Welch

Edwin R. Embree, *Secretary*
Margery K. Eggleston, *Assistant Secretary*

Roger S. Greene	*Director*
Henry S. Houghton	*Acting Resident Director in China*

DIVISION OF MEDICAL EDUCATION

Richard M. Pearce, M.D., *General Director*

Assistance to Other Agencies

In addition to the work carried out through the departmental organizations described above, the Rockefeller Foundation has contributed during the year to the accomplishment of work undertaken by other and unaffiliated organizations.

On pages 82 to 83 will be found a summary of payments made by the Rockefeller Foundation for all purposes during the year 1921. This tabular summary outlines, in terms of expenditures, the work described in terms of aims and results in the President's Review. In many instances these payments involved sums expended

on account of appropriations made in former years. On the other hand, they represent in some instances but partial payments on many of the appropriations, made during 1921, which will provide for continuing work during succeeding years. For a full statement of the finances of the Foundation, see the Report of the Treasurer, pages 339 to 409.

TABLE 3: EXPENDITURES OF THE ROCKEFELLER FOUNDATION FOR THE YEAR 1921

I. PUBLIC HEALTH	
A. International Health Board	
1. Regular program in Hookworm, Malaria, Yellow Fever, and County Health	$1,107,604
2. Tuberculosis in France	438,951
3. Fellowships and Public Health Education	82,696
B. Studies and Demonstrations	
1. Mental Hygiene	86,371
2. Hospital and Dispensary Service and Studies	84,823
C. Schools of Public Health in the United States	333,375
	$2,133,820
II. MEDICAL EDUCATION	
A. China Medical Board	
1. Regular program of aid to Medical and Pre-Medical Schools and to Hospitals	$419,705
2. Peking Union Medical College	
(a) Land and Buildings	1,114,973
(b) Operation	393,349
3. Fellowships and Scholarships	27,423
B. London Medical Center	826,296
C. Canadian Medical Program	1,158,853
D. Central Europe: Journals and Apparatus	43,813
E. Pasteur Institute	30,000
F. University of Chicago—Interest on Pledge	43,739
G. Fellowships and Scholarships	17,574
H. Brazil	12,169
I. Commissions and Studies of Medical Education	31,367
	$4,119,261

III. MISCELLANEOUS

(Chiefly payments on previous pledges)

A. American Academy in Rome—(Payments on 10-year pledge made in 1914)	$10,000
B. American Medical Association—(Toward publishing Spanish Edition of Journal)	8,000
C. American Relief Administration—(Child Feeding Program in Europe)	1,000,000
D. Committee on Reference and Counsel of Annual Foreign Missions Conference of North America	35,000
E. Common Service Committee—(For Correlation of Service of Health Agencies)	19,304
F. Concilium Bibliographicum, Zürich	21,461
G. National Information Bureau—(For Membership for year 1921)	1,000
H. National Research Council—(Fellowships in Physics and Chemistry)	60,574
I. New York Association for Improving the Condition of the Poor—(Payment on 10-year Pledge made in 1914)	20,000
J. Rockefeller Institute for Medical Research and Johns Hopkins University—(For Special Investigations)	5,750
K. Grand Chenier Bird Refuge—Taxes and Expenses	7,713
L. Final Payments on Work begun in connection with War Emergency	2,682
	$1,191,484

IV. ADMINISTRATION

A. Maintenance of Executive Offices and Treasurer's Office	$170,123
B. Furniture and Fixtures, and Books	15,669
	$185,792
	$7,630,357

Funds and Property

As of December 31, 1921

PRINCIPAL FUNDS

General Fund		$171,204,624
Reserve (excess of amounts received from sales and redemption of securities over their book value, set aside to offset future losses)		3,190,533
Special Funds:		
Gifts of John D. Rockefeller	$37,000	
Gifts of Laura S. Rockefeller	49,300	
Henry Sturgis Grew Memorial Fund	25,000	
Arthur Theodore Lyman Endowment	5,500	116,800
		$174,511,957

LANDS, BUILDINGS, AND EQUIPMENT

In China: Medical School Lands, Buildings, and Equipment		$8,631,833
In New York: Furniture and Equipment of Offices		34,980
		$8,666,813

UNDISBURSED INCOME

General Income (For offsetting liabilities see below)		$7,359,001
Special Income Accounts:		
Estate Laura S. Rockefeller	$65	
Henry Sturgis Grew Memorial	4,083	
Arthur Theodore Lyman Endowment	714	4,862
		$7,363,863

UNPAID APPROPRIATIONS AND PLEDGES

Balance due on appropriations payable in 1921 and prior years		$4,032,998
Appropriations and pledges which become effective in 1922 and following years:		
1922	$6,280,746	
1923	4,619,892	
1924	3,460,067	
1925	2,596,191	
1926	2,229,500	$19,186,396
		$23,219,394

INTERNATIONAL HEALTH BOARD

Report of the General Director

INTERNATIONAL HEALTH BOARD

Report of the General Director

To the President of the Rockefeller Foundation:

Sir:

I have the honor to submit herewith my report as General Director of the International Health Board for the period January 1, 1921, to December 31, 1921.

Respectfully yours,

WICKLIFFE ROSE,

General Director.

INTERNATIONAL HEALTH BOARD

OFFICERS AND MEMBERS

PERSONNEL OF STAFFS DURING 1921[1]

ADMINISTRATIVE STAFF

WICKLIFFE ROSE, *General Director*

JOHN A. FERRELL, M.D., *Director for the United States*

VICTOR G. HEISER, M.D., *Director for the East*

HECTOR H. HOWARD, M.D., *Director for the West Indies*

L. W. HACKETT, M.D., *Associate Regional Director (for Brazil)*

FREDERICK F. RUSSELL, M.D., *Director of Public Health Laboratory Service*

FIELD STAFF

HOOKWORM

AUSTRALIA (including Papua and late German New Guinea)	W. A. Sawyer S. M. Lambert[2] C. N. Leach W. C. Sweet[2]
BRAZIL	L. W. Hackett G. K. Strode Paes de Azevedo (resigned)
Alagoas	F. L. Soper (survey) Alan Gregg
Espirito Santo	G. K. Strode Alan Gregg (survey) J. H. Janney[2] (survey)
Pernambuco	Alan Gregg F. L. Soper
Rio de Janeiro	G. K. Strode
Rio Grande do Sul	Alan Gregg F. L. Soper
Santa Catharina	Alan Gregg F. L. Soper
São Paulo	G. K. Strode
BRITISH NORTH BORNEO	C. H. Yeager

[1] Personnel employed by Government in co-operative work not listed.
[2] Special Staff Member.

British Solomon Islands (survey)	S. M. Lambert[1]
Ceylon	W. P. Jacocks G. G. Hampton C. N. Leach S. A. Winsor (resigned)
Colombia	F. A. Miller
Costa Rica	Louis Schapiro J. E. Elmendorf, Jr.
Dutch Guiana	W. C. Hausheer
Guatemala	E. I. Vaughn J. E. Elmendorf, Jr.
India	J. F. Kendrick G. P. Paul
Jamaica	B. E. Washburn
Nicaragua	D. M. Molloy
Panama	F. C. Caldwell
Porto Rico	R. B. Hill
Salvador	C. A. Bailey
Siam	M. E. Barnes H. R. O'Brien[1]
Trinidad	G. C. Payne W. C. Hausheer J. L. Rice[1]

COUNTY HEALTH WORK IN UNITED STATES

Alabama	F. W. Dershimer A. L. McKay (resigned)
Indiana	G. P. Paul
Kansas	A. J. Warren
Kentucky	P. W. Covington

[1] Special Staff Member.

LOUISIANA	P. W. Covington Hugo Muench, Jr.[1]
NEW MEXICO	J. F. Docherty D. B. Wilson
TEXAS	A. P. Harrison[1]

MALARIA

ALABAMA	E. B. Johnson[1] (resigned) William Ropes[1]
ARKANSAS	F. P. Gilbert[1] L. G. Hastings[1] (resigned) William Ropes[1]
LOUISIANA	L. J. Petritz
MISSISSIPPI	C. C. Bass[1] J. L. Clarke[1]
MISSOURI	M. F. Boyd
NICARAGUA	F. E. Hulse[1]
NORTH CAROLINA	H. A. Taylor C. E. Buck[1] (resigned) J. J. Mieldazis[1]
PORTO RICO	H. W. Green[1]
SOUTH CAROLINA	J. J. Mieldazis[1]
TENNESSEE	H. A. Johnson[1] N. H. Rector[1]
TEXAS	E. H. Magoon[1] Geo. Parker[1]
VIRGINIA	E. H. Gage[1] (resigned)

YELLOW FEVER

YELLOW FEVER ADVISORY COUNCIL[2]

Henry R. Carter, M.D., Assistant Surgeon General, United States Public Health Service

[1] Special Staff Member.
[2] Not Staff Members; appointed to serve in an advisory capacity.

Juan Guiteras, M.D., Secretary, Department of Health and Charities, Cuba
Hideyo Noguchi, M.D., Rockefeller Institute for Medical Research
Joseph H. White, M.D.,[1] Assistant Surgeon General, United States Public Health Service

Mexico and Central America	T. C. Lyster[1]
British Honduras	E. I. Vaughn
Guatemala	E. I. Vaughn
	H. K. Marshall[1] (resigned)
	T. F. Botello[1]
Honduras	E. I. Vaughn
	C. A. Bailey
Mexico	J. H. White[1]
	B. W. Caldwell[1]
	M. E. Connor
	W. M. Monroe
	E. I. Vaughn
Nicaragua	D. M. Molloy
Salvador	C. A. Bailey
	W. H. Davies[1] (resigned)
Peru	J. H. White[1]

TUBERCULOSIS

France	L. R. Williams[1]
	Alexander Bruno[1]
	F. Elisabeth Crowell[1]
	B. L. Wyatt[1] (resigned)

SPECIAL

Australia—Public Health Administration

A. J. Lanza[1]—Lent to Department of Health for two years to assist in organization of Department of Industrial Hygiene
F. F. Longley[1]—Lent to Department of Health for two years to assist in organization of Department of Sanitary Engineering

Brazil—County Health Work

J. H. Janney[1]

Public Health Nursing Service

Mrs. Ethel Parsons[1]

School of Hygiene and Public Health, São Paulo

W. G. Smillie, Director and Professor of Hygiene

[1] Special Staff Member.

China—Special Service

J. B. Grant—Lent to Peking Union Medical College as Associate Professor of Hygiene and Public Health

Czechoslovakia—Public Health Administration

S. M. Gunn [1]

Paraguay—Public Health Survey

L. W. Hackett

Philippine Islands—Public Health Survey

V. G. Heiser

ON LEAVE

(for whole or part of year)

W. T. Burres
S. T. Darling [1]
H. H. Howard
J. J. Mieldazis [1]
Louis Schapiro

AT HOME OFFICE

C. W. Wells (in charge of fellowships)
J. L. Hydrick

ENGAGED IN SPECIAL STUDY (Johns Hopkins School of Hygiene and Public Health)

S. T. Darling [1]
J. B. Grant
Louis Schapiro

IN TRAINING

Australia	C. N. Leach W. C. Sweet [1]
Brazil	J. H. Janney [1]
Ceylon	C. N. Leach
Mexico	W. M. Monroe
Siam	H. R. O'Brien [1]
Tennessee	H. A. Johnson [1] N. H. Rector [1]

[1] Special Staff Member.

PROMOTING HEALTH IN MANY LANDS

The period of three years since the armistice has been one of unprecedented activity in government organization for war on disease: new national health services, including new ministries of health, have been created in England, France, Australia, Czechoslovakia, Poland, and the kingdom of the Serbs, Croats, and Slovenes; in other countries national and state services have been reconstituted with enlarged powers and resources; public funds for health purposes have been enormously increased; and the call for qualified men is being met by the establishment of institutions to provide the training required. During the year 1921 the International Health Board has shared in activities designed to promote this movement in sixty-three states and countries throughout the world.

I

International Co-operation in Yellow Fever Control

There are important public health functions which are essentially international in character. No nation acting alone can perform them. Among these is the control of the great epidemic plagues of which yellow fever is a conspicuous example. For more than 200 years prior to the

work of Reed and his colleagues at Havana the tropical and semi-tropical regions of the Americas had been subject to devastating invasions of this disease. During this period appalling epidemics swept repeatedly over the coastal regions of Brazil as far south as Rio de Janeiro, up the Amazon valley, along the Caribbean littoral, throughout the West Indies, Central America, Mexico, and the southern United States, and over the west coast of America from Callao in Peru to Mazatlán in Mexico. The infection had crossed the sea to West Africa; had apparently become endemic there; and had appeared from time to time in places as remote from its original source as England, France, Spain, and Italy. No country had the power of self-defense. Despite the

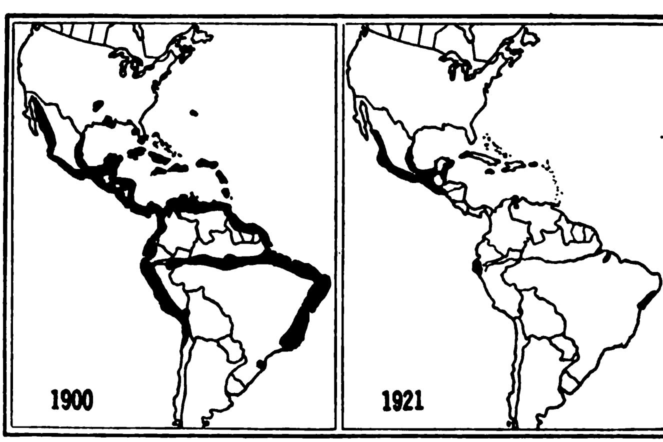


Fig. 12.—Yellow fever map of the Western Hemisphere. The shading indicates localities in which one or more cases of the disease appeared. Compare 1921 with 1900. The disease is steadily retreating as the concerted attack progresses

most rigid quarantine regulations the infection overran national boundaries, decimating populations, paralyzing industry and trade, and holding the people of these regions in a state of perpetual dread.

Reed and his commission discovered the key to yellow fever control. By international concert of effort the infection, so far as the Western Hemisphere is concerned, has been pretty well delimited and its boundaries are being steadily driven in (see Fig. 12, page 96).

Fighting an Epidemic in Peru

The Pacific coast from Panama to Callao in Peru is treated as a unit. Since the days of Gorgas in Panama a low Stegomyia index steadily maintained has protected that community against reinvasion. Recent inspection in Buenaventura, Colombia, indicates satisfactory conditions with no traces of danger in that port of entry. No case has been reported from Ecuador since May, 1919. Dr. Pareja, local health officer, is holding the mosquito index in Guayaquil below the danger point as a safeguard against reinvasion from Peru.

The scene of active operations on this coast during 1921 has been in Peru. At some time preceding its elimination from Ecuador in 1919 it had crossed the border into Peru and had become

well established there before being recognized as yellow fever. Because of limited funds and lack of trained personnel, first efforts at control were on an inadequate scale. By March, 1920, the disease had appeared in serious epidemic form over a wide region in the department of Piura and is estimated to have numbered about 6,000 cases before its final suppression in August of that year. Again the infection escaped. Just before its final extinction in Piura it had crossed a desert zone which had been depended upon to protect the region farther south, and under the guise of "acute malaria" had established itself in the department of Lambayeque. With a dense, non-immune population and an extremely high Stegomyia index—from 60 to 100 per cent—it spread with great rapidity. From Lambayeque the epidemic extended south through the department of Libertad with an estimated total of from 10,000 to 15,000 cases.

Fig. 13.—Scene of the violent yellow fever epidemic in Peru during 1921

Controlling the Epidemic with Fish

In February, 1921, Government placed Doctor Henry Hanson in charge of the campaign with full authority. The International Health Board was called upon to supplement available funds. Competent local physicians were enlisted; a limited number of trained inspectors were brought down from Panama; and as rapidly as possible systematic operations were organized to cover not only the infected area but also a considerable barrier zone lying south of the region of known infection. All effort was centered on the control of Stegomyia breeding.

Here as in Guayaquil the result was finally accomplished by enlisting two local species of fish to devour the eggs and larvae of the mosquito. An attempt in the beginning of the campaign to teach the people to prevent breeding on their own premises failed. Everything had to be done by the mosquito squad. Effort to keep water containers covered was equally unsuccessful. Straining the water (which in that dry country was too precious to be turned out) involved an amount of labor that made it impracticable for a region so vast. It was found that by distributing fish—two to four small fish to a container holding ten to fifteen gallons—the problem was simplified by about 75 per cent, with a lower resulting mosquito index than it had been possible to get in any

other way. The 750,000 fish distributed in this drive conquered the epidemic. The last case was reported from Libertad on July 16.

No case has been reported from Piura since August, 1920, and there has been no known case anywhere in Peru since July, 1921. So vast, however, is the region covered by the epidemic and so often has the infection lingered unrecognized in remote communities that one would not venture at this time to declare the country free. As a precaution against the reappearance of the disease the drive against Stegomyia is to be continued up to May, 1922. It will cover the entire region from Ecuador to Callao—a distance of 500 miles—and from the sea back to the mountains—a zone varying in width from fifty to seventy-five miles. If up to that time no case shall have appeared the forces will be demobilized.

Yucatan a Historic Center of Infection

As Guayaquil for more than seventy-five years had served as the endemic focus from which yellow fever has spread from time to time over the Pacific coast, so Merida, in Yucatan, has been regarded by sanitarians as an important seed-bed of long standing from which the infection has been distributed repeatedly throughout Mexico and the Central American countries.

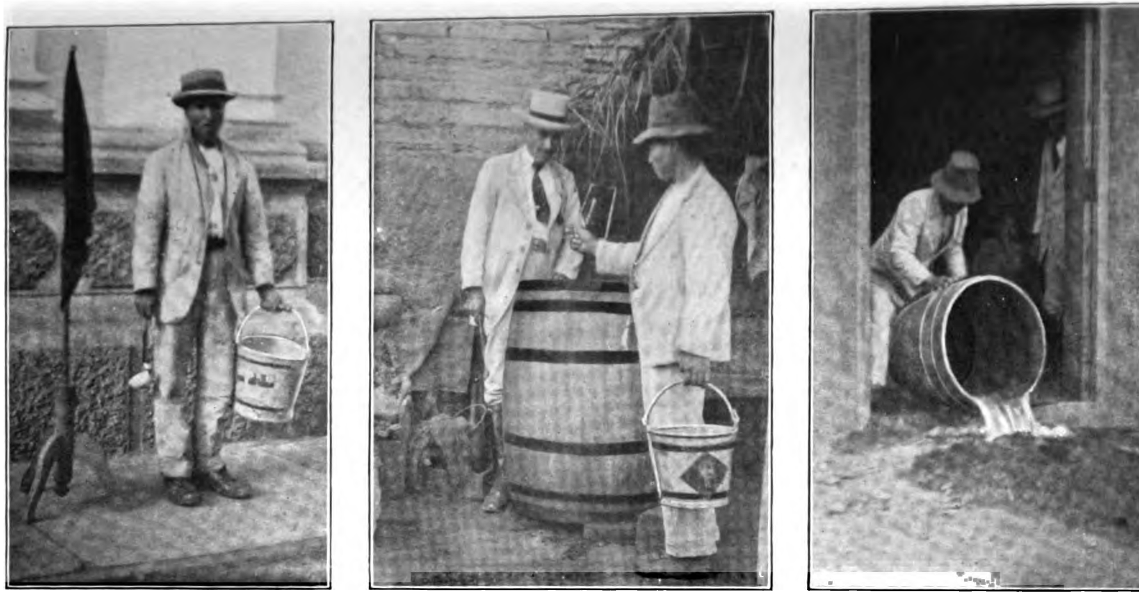


Fig. 14.—Three aspects of yellow fever control effort in Peru during 1921. *Left:* sanitary inspector with equipment carried on his rounds; *center:* stocking a water container with small fish to devour the Stegomyia larvae; *right:* emptying a container as a preliminary to refilling with pure water and stocking with fish

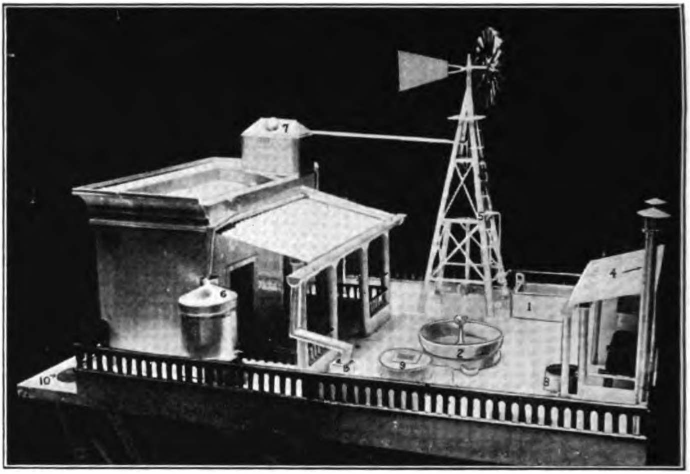


Fig. 15.—A small model showing the types of water containers used about the dwellings in Merida, Yucatan. The exhibition of this model, made of scrap tin by an inspector in his spare time, did much to arouse the interest of householders in preventing mosquito breeding

Fig. 16.—Shallow, driven tubular well for preventing Stegomyia breeding, Corinto, Nicaragua. The placing of fish in the open wells of this town freed the water of larvae, but frequent careful inspection was necessary. The driven well has solved the problem. A small block and platform of concrete are adequate to protect it

Recent archeological studies in Yucatan have given the subject an added interest. They bring to light the records of devastating yellow fever epidemics in the Maya cities of this densely populated region antedating the Spanish invasion. It is to this cause Dr. Spinden[1] attributes the depopulation of these ancient cities and the decay of Maya civilization in the lowlands bordering the Gulf. It is one of the great plagues of the early Spanish records. Throughout modern times it has remained a scourge of this region, with Merida as an important source of infection. Within the last few years the disease has appeared in epidemic form throughout eastern Mexico, on the Mexican Pacific coast from Mazatlán to Guatemala, in Guatemala, Salvador, Nicaragua, Honduras, and British Honduras.

Winning by Team-Play

No one of these countries acting alone could protect itself. The effort was much like attempting to empty a spring with a spoon. Guatemala, for example, suppressed an epidemic which had spread to sixteen communities on the Pacific coast in 1918, only to have the infection reintroduced the following year. Now, by international co-operation, control measures over this

[1] Yellow Fever—First and Last. By Herbert J. Spinden. *World's Work*, December, 1921, p. 169–181.

entire region are being administered as a unit. Active operations in each country are being carried out by a yellow fever commission created by special decree, under the national departments of health and clothed with authority. The necessary unity of effort is secured by the simple device of giving the International Health Board representation on each of these commissions.

This united drive opened in Salvador, Nicaragua, Guatemala, and Honduras in 1920; in Mexico in January, 1921; and in British Honduras in August, 1921. The Mexican department of health had been active on its own account during the previous year and had done much to reduce the severity of the epidemic that had swept over the eastern part of that country from Yucatan to Tampico. In this campaign as in Peru effort is centered on the control of Stegomyia breeding. The problem has been enormously simplified by permanently sealing the domestic tanks and by using larvae-devouring fish in all containers holding sufficient water to support fish life. By the introduction of these two simple devices in Guayaquil in 1919 Dr. Connor had been able to reduce his field staff for a given area from 139 men to twenty men. Experience during 1921 abundantly confirms the result.

War on the mosquito is conquering the disease. At the present time there seems to be no yellow

fever in Merida or anywhere in Yucatan. The important base ports of Campeche, Vera Cruz, Túxpan, and Tampico are being held with a Stegomyia index sufficiently low to prevent the transmission of infection within these communities; and from these centers control measures are

Fig. 17.—Map of Mexico and Central America showing towns visited by yellow fever in 1921

being gradually extended to the outlying communities. A smouldering infection still remains in a back-country region about Papantla; in a densely populated agricultural valley west from Cosamaloapan in the southern part of the state of Vera Cruz; and along the Gulf coast in British Honduras from Belize to Santa Cruz de Bravo in Quintana Roo. Within recent months system-

atic mosquito control has been undertaken on the Mexican Pacific coast, where the infection seems to have been appearing from time to time for the last three years over a vast region from Manzanillo to Mazatlán. These remaining areas of infection should involve no particular difficulties. No case of yellow fever has been reported from Nicaragua, Salvador, Guatemala, or Honduras for more than ten months. The number of cases reported from Mexico and Central America for 1920 was 710; for 1921 the total number of reported cases is 145, as shown in Fig. 18.

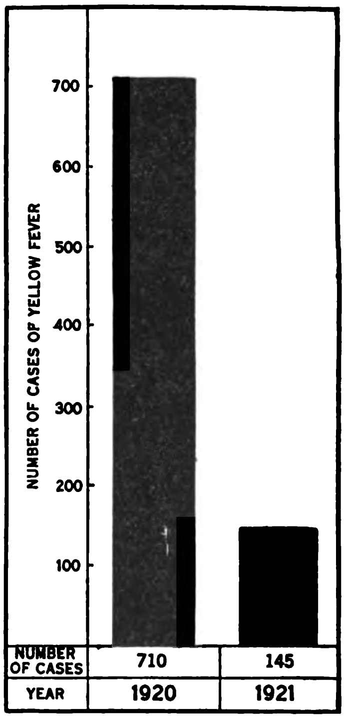


Fig. 18.—Yellow fever cases in Mexico and Central America, 1920 and 1921. Control effort is being continued to stamp out the infection

Government Continuing the Attack in Brazil

The other remaining center of yellow fever on the Western Hemisphere is in Brazil. The infection, formerly covering the entire coast from

Rio de Janeiro north and up the Amazon valley to Yquitos in Peru, seems now to be confined to a narrow coastal zone from Pernambuco to Bahia. These two cities are presumably the endemic foci. In April an epidemic was reported in the state of Bahia. It had apparently been in progress for months, had spread over a considerable area, and numbered from 400 to 500 cases. Cases were reported also from Natal in Rio Grande do Norte, from Porto Calvo, Alagoas, and from the district between Alagoas and Pernambuco.

Until the last vestige of yellow fever has been stamped out here this region must be recognized as a constant menace to the rest of Brazil, to the coasts of Venezuela and Colombia, and to the neighboring West Indies. Freedom from the disease for a considerable period has given opportunity for the development in these countries of a non-immune population. A reinvasion at this time would probably be vastly more disastrous than it could have been ten years ago. The Brazilian national department of health is continuing the fight against the disease in and about Pernambuco and Bahia, and has ample funds for the purpose.

Yellow Fever Commission to West Africa

In 1920 the Board sent a commission to West Africa to determine if possible whether yellow

fever is present in that region, and if so, whether control measures would be feasible. The commission visited the Belgian Congo, Dahomey, Gold Coast, Northern Nigeria, Senegal, Sierra Leone, and Southern Nigeria; saw no case of yellow fever; conferred with medical authorities and examined many records; found strong indications of the presence of the infection within recent years; and recommended that a second commission be sent out prepared to stay, if necessary, for a period of two years for a more extended investigation—this to include a laboratory study of the suspected fevers of the region. The Board has approved. The fixing of the date of departure for this second commission must await the necessary arrangements with governments concerned, the special training of laboratory personnel, and the development of operations in other fields making possible the release of clinical specialists for the staff.

The Noguchi Vaccine and Serum

Killed cultures of *Leptospira icteroides* as a protective vaccine against yellow fever were first prepared and tested by Noguchi in Guayaquil in 1918. The use of the vaccine with laboratory animals had demonstrated its value in producing immunity. During the year 1920 it was used on a considerable scale on human subjects in Mexico

and Central America, and the test was continued during the year 1921 in these countries and in Peru. The cumulative results of the two years' experience tend to confirm the earlier indications. To take a single striking example, Dr. Hanson vaccinated 200 non-immune soldiers in Lambayeque, Peru, and 200 civilians in Paijan. They went through a severe epidemic without a case among them. Continued tests of the therapeutic serum tend also to support the earlier results. When administered in the early stages of the disease it seems greatly to increase the chances of recovery.

II

Extending the Front against Malaria

Despite the economic depression which hit the Southern States with extreme severity, the fight against malaria has been maintained and steadily extended. A series of field experiments carried out in previous years had shown that malaria control in towns having a population of 1,000 or over and representing average conditions in these states is a paying investment. Effort was made during the year 1920 to drive this fact home throughout the more heavily infected region. By joint arrangement state departments of health, local communities, the United States

Public Health Service, and the International Health Board shared in carrying out demonstrations in fifty-two towns in ten states during 1920. In some communities control was effected mainly by the top minnow (*Gambusia affinis*).

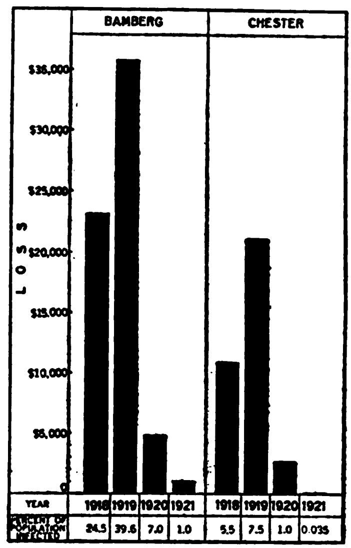


Fig. 19.—What malaria has cost the towns of Bamberg and Chester, South Carolina, during the years 1918 to 1921, inclusive, in the form of wages lost, doctors' bills, and medicines. Combined population, 7,768. Control measures instituted in both towns in 1920 have strikingly reduced this economic loss

Malaria cases in these communities were reduced from 30 to 98 per cent at an average per capita cost of about seventy-eight cents. These results graphically exhibited were given wide publicity. The effect has been the creation of a sustaining and even aggressive public opinion which would seem to guarantee the permanency of the work.

During the year 1921 the service has been consolidated and extended. State and local funds have been increased. Malaria control is being made an integral part of the county health program and the states are assuming the responsibility

for its central supervision. Six states—Alabama, Arkansas, Mississippi, Missouri, South Carolina, and Virginia—have provided central administrative budgets and are appointing specially trained personnel for the purpose. To meet

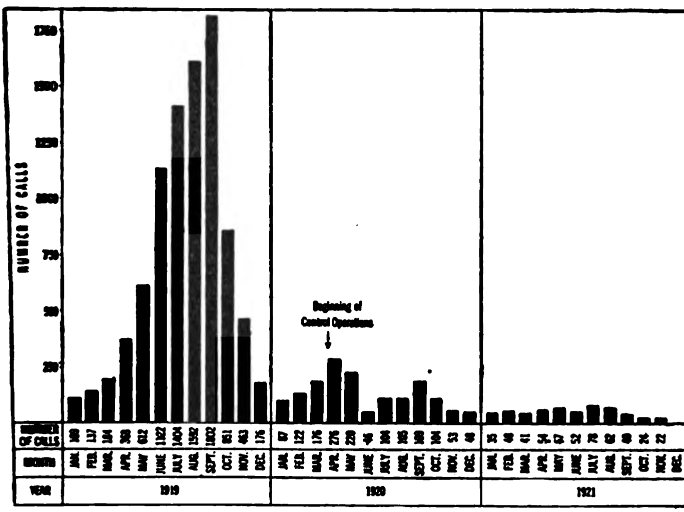


Fig. 20.—Reduction in physicians' calls for malaria in Groveton and South Groveton, Texas. Combined population, 2,500. Control operations beginning on April 1, 1920, strikingly checked the development of malaria cases during the remainder of 1920 and in 1921 kept the number of cases at a mere fraction of the number in 1919, which was typical of conditions in pre-control years

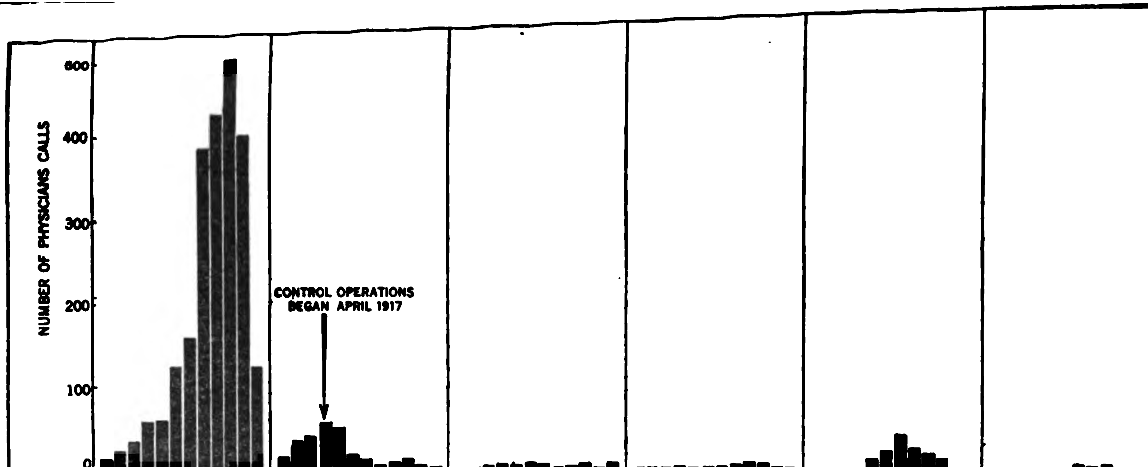
the increasing demand for sanitary engineers and physicians who have had special training in this field, the Board has undertaken to maintain a considerable reserve corps through a period of apprenticeship. On completion of their training they are taken into federal, state, or county service.

Intensive demonstrations have been undertaken during 1921 in twenty-six additional towns. In a number of communities—as in Texas for example—the municipal governments have provided the entire cost of the work save that of general supervision. For typical results see Figs. 19 and 20, pages 110 and 111.

Malaria Control on a County-Wide Scale

Field experiments in which the Board has shared hitherto have had for their object the testing of separate control measures: mosquito control in small towns; mosquito control in a typical rural community; quinine for sterilizing the blood of the infected; protection by the screening of houses. These nibbling efforts have served their purpose. During the year 1921 a major attack against malaria has been opened along the entire front, including town, village, and the open country. The unit of operations is the county. Malaria control is undertaken as a part of the permanent county health scheme; is supported by state, county, and local funds; and is under the direction of the county health officer.

All available measures are employed, each receiving emphasis according to local conditions. In Alabama, where an energetic sanitary engineer is co-operating with the health officers in a group



YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	POPULATION	COST	PER CAPITA COST
1916	13	25	36	58	60	125	160	385	425	500	400	125	1200	–	–
1917	15	35	40	57	50	19	11	5	7	12	5	3	1285	$1,860	1.45
1918	1	2	4	7	5	8	6	3	4	7	3	9	1350	$565	.42
1919	1	1	1	2	1	2	3	5	8	6	2	1	1450	$1,000	.69
1920	0	0	0	0	12	22	40	25	18	12	0	0	1538	$1,250	.81
1921	0	0	0	0	0	0	4	2	5	0			1600	$1,000	.63

Fig. 21.—Record of malaria incidence for town of Hamburg, Arkansas, which has maintained anti-mosquito measures for five successive years. The work is now regarded as a regular municipal function. This town and Crossett, Arkansas, were the scenes of the International Health Board's first participation in malaria control by anti-mosquito measures

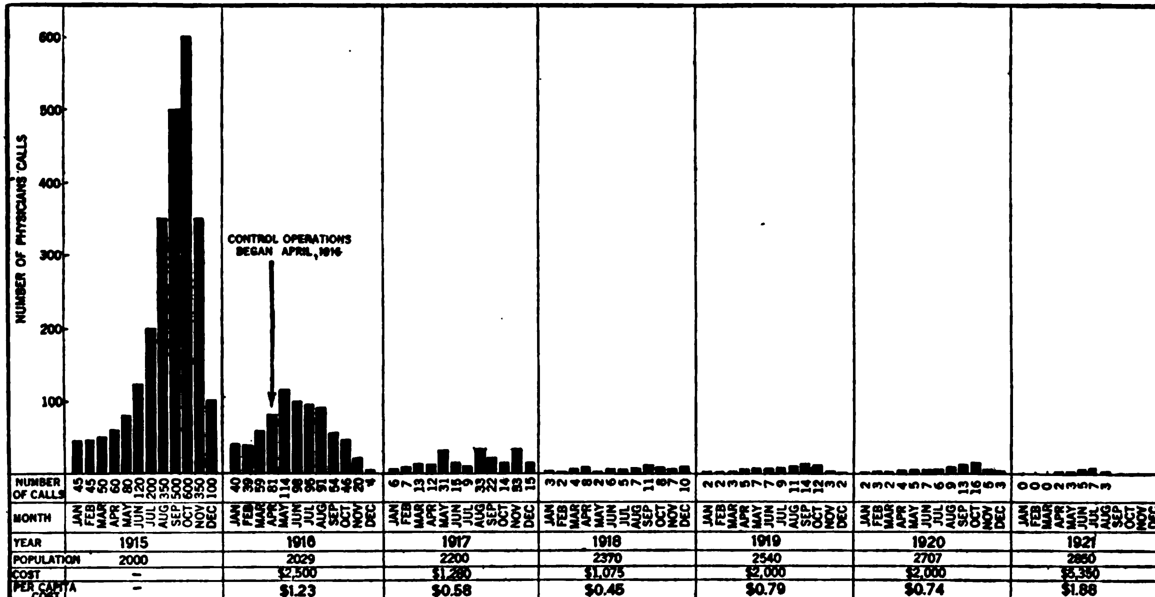


Fig. 22.—How malaria has been brought under control in Crossett, Arkansas. The anti-mosquito measures inaugurated in 1916 have been continued year by year, and in 1921 a system of concrete ditches and culverts was laid. The town is finding it much more economical to protect itself against malaria than to suffer the losses the disease involves

of five counties, mosquito control is being extended to rural communities. The top minnow —shown by Dr. Howard in his experiment in Mississippi to be effective and economical in controlling mosquito breeding about farm houses —is the principal agent here. The farmers are maintaining minnow ponds from which mosquito-breeding waters may be easily stocked with fish. In the Mississippi delta, on the other hand, where mosquito control is less feasible, anti-mosquito measures are not neglected where conditions favor, but greater emphasis is being placed on sterilizing quinine treatment. In all counties where the work has been undertaken the people are being taught to screen their houses as a protection against flies and mosquitoes. The standard quinine treatment for those who have malaria is provided at convenient points and its use is being stimulated by systematic education. This county-wide effort is being undertaken not as a brief intensive drive, but as a slow, steady campaign to be continued over a period of years.

Field Experiments in Malaria Control

A limited number of field experiments are being continued. As a result of Dr. Bass's work in Bolivar and Sunflower counties in Mississippi a standard quinine treatment for malaria in this region has become established and its use is being

gradually extended to other counties and states. At Mound, Louisiana, tests are being carried out with a view to getting additional information on the screening of houses as a factor in malaria control; the effect of the location of houses, in relation to mosquito-breeding places, on the incidence and severity of malaria; effect of killing adult mosquitoes in homes; control of mosquito breeding by top minnows and wave action, in connection with impounding water in bayous and keeping down the marginal vegetation by pasturage. An experiment has been undertaken in Nicaragua to test the control of mosquitoes in a small town, under tropical conditions, by the simple and relatively inexpensive measures that have been successful in the Southern States. A similar test is being conducted in Porto Rico in an agricultural area.

III

Fighting Tuberculosis in France

The commission which the Board sent to France in 1917 to aid in organizing a national crusade against tuberculosis is well within sight of the end of its task. Responsibility is being rapidly transferred to French authorities. When the work began four years ago the French government and people were bearing the burdens of a devastating war and were carrying the additional

Fig. 23.—Tuberculosis exhibit at Pasteur Institute, Paris. Publicity measures are an essential feature of the campaign against tuberculosis in France

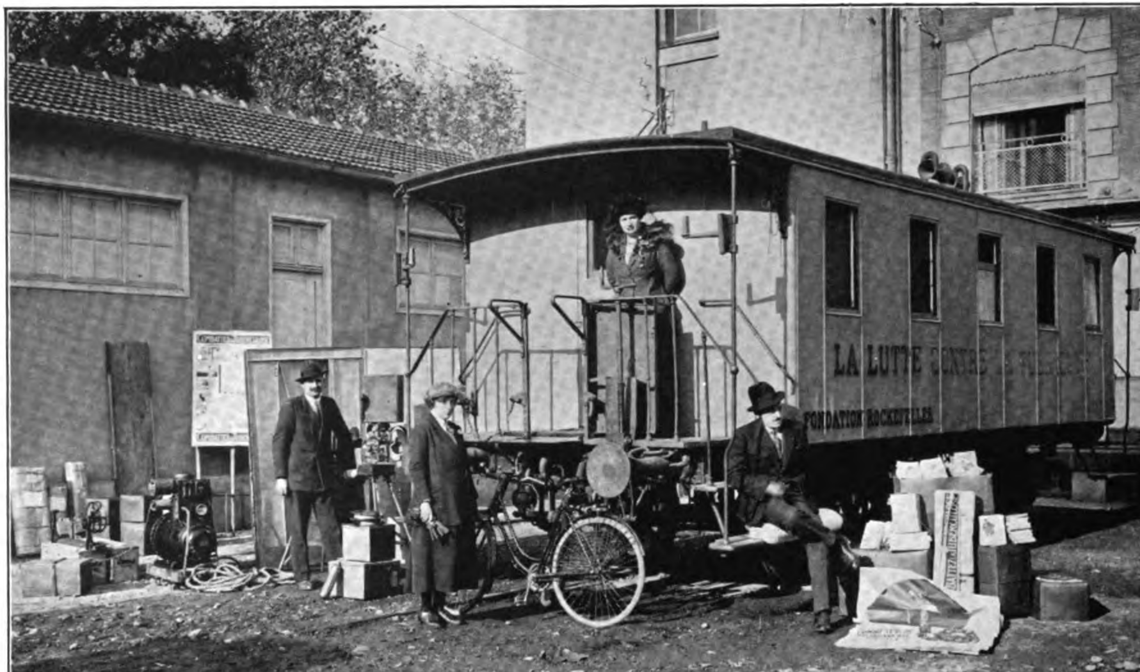


Fig. 24.—Traveling educational units have met with marked success in the anti-tuberculosis work in France. Motors cars and a special railway car have been used for transporting personnel and equipment. During 1921 fifteen departments were visited; 1,294 lectures were delivered to audiences aggregating 470,078; and a total of 3,594,500 pieces of literature were distributed

weight of a heavy tuberculosis rate which, as in all the warring countries, was supposed to be on the increase. There were in the country at that time but twenty-two tuberculosis dispensaries, and for persons needing hospital or sanatorium care not more than 8,000 beds.

To meet the situation a great multiplicity of agencies—French and American, official and non-official, military and civilian—pooled their interests in a spirit of team-play that made possible a coherent program. A scheme was projected on a national scale. It undertook to promote the establishment of tuberculosis dispensaries; to develop nursing schools for the training of public health visitors; to provide graduate courses for the training of doctors for the service; to establish a central records and statistical service; to conduct a nation-wide campaign of popular education; and in the end to stimulate the provision of hospital beds and sanatoria for the cases that need such care.

This united effort has met with enthusiastic response. The whole of France has been reached through the press and by literature in the schools. Mobile exhibits with teaching personnel have covered systematically fifty-four departments. In sixty-four departments the usual organization has been set up, providing for the operation of dispensaries and the maintenance of

hospital beds. The national government is granting subventions for the building of sanatoria. Eight training schools for public health visitors are in operation; and of these, five seem to be on a permanent basis. Beginning with 1922 all but one are to offer a two-year course. Diplomas have been given to about 250 women who have completed the course and who are now serving, some of them as departmental supervisors, the others in local dispensaries. The graduate course in tuberculosis, which from the beginning awakened unexpected interest, has been completed by 264 dispensary physicians. All activities undertaken in 1917 may be regarded as rooted in French soil; they are being supported by Government and the people. The commission has been dissolved. Dr. Linsly R. Williams with a limited American staff represents the Board in completing the transfer of responsibility. Comradeship in this service to all who have shared it has been an inspiring privilege.

IV

Using the Hookworm in Promoting Public Health

Of the estimated seventeen hundred million people inhabiting the globe, something more than nine hundred million live in countries where hookworm infection is a serious menace to health and working efficiency. With increasing pres-

sure for the development of tropical and subtropical lands the control of this disease—as of malaria and sleeping sickness—becomes a matter of serious international concern. Hookworm disease has been selected by the Board for special consideration, however, not primarily because of its relative importance as a disabling disease, great as that is, but rather because it lends itself readily to purposes of demonstration in disease control. It serves at once as an end in itself and as a convenient means to a larger end. The work, while bringing immediate relief to hundreds of thousands of suffering people, is at the same time serving the more useful purpose of creating a popular sentiment in support of permanent agencies for the promotion of the public health.

During the year the Board contributed toward demonstrations in hookworm control in forty-three states and countries throughout the infected zone; completed infection and sanitary surveys in the states of Alagoas and Espirito Santo, Brazil, in New Guinea, in the British Solomon Islands, in Tasmania, and in Queensland; and began surveys which are still in progress in New South Wales, in Western Australia, and in Northern Territory, Australia. Arrangements were entered into with Government for a series of demonstrations in Mauritius and Honduras. Re-infection surveys to determine re-

sults of previous work and to serve as a stimulus to further effort were carried out on a county-wide scale in forty-five counties in the Southern United States and in a number of smaller areas in Jamaica and Brazil.

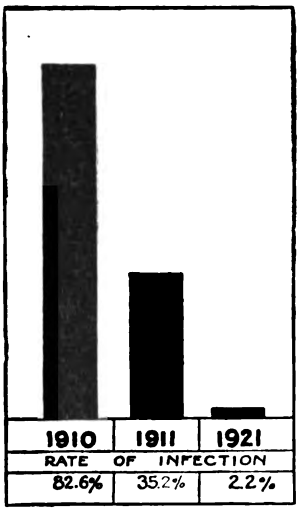


Fig. 25.—The hookworm story of Richmond county, Virginia. When the first demonstration in hookworm control in the United States was begun in this county in 1910, 82 per cent of the school children were infected. As a result of intensive treatment the infection was reduced in fifteen months to 35 per cent. Local agencies set in motion in 1910 have kept up the work until now hookworm infection in that county is negligible

The character of the work and the policy underlying its administration are well illustrated in

The First Field Demonstration

The first systematic effort to control hookworm disease in the United States was undertaken in 1910 in Richmond county, Virginia. It was under the direction of the Virginia State Board of Health, with the Rockefeller Sanitary Commission supplying the funds. An infection survey made in April of that year showed an average infection of 82.6 per cent among the school children. In one large section of the county the infection was found to in-

volve practically the entire population and to be extremely severe. There followed an intensive effort to examine all the people; to treat those who were found infected; and by house-to-house visits to give them a definite understanding of the importance and the means of preventing soil pollution. Sanitary leagues were organized in local communities. Latrines were installed at all the schools and by persistent effort were gradually brought into use at nearly all the homes.

A second survey made in the summer of the following year showed that the infection among the school children had dropped from 82.6 to 35.2 per cent. Then the interesting thing happened. Outside aid was withdrawn; the county and its communities were left to their own devices. A third survey made ten years later—in the summer of 1921—showed that the infection among school children had dropped to 2.2 per cent. The first intensive demonstration in 1910, while reducing hookworm infection from 82.6 to 35.2 per cent, set in motion permanent local forces which within ten years have reduced the infection rate to the negligible fraction of 2.2 per cent (see Fig. 25, page 122).

And while conquering hookworm these same forces are conquering typhoid and dysentery as

well. The recent survey referred to above showed that the people have latrines at their homes and are using them. Only two negro homes, two white tenant homes, and one white home owned by the occupant, were found without such protection. The late Dr. Fisher, who had been a practicing physician here for more than thirty-five years, stated that typhoid and dysentery used to bulk large in his practice. He had not had a case of either of these diseases for more than five years. He also reported—and the statement is abundantly supported by the facts as observed by the General Director, who visited the community in June, 1911, and again in November, 1921—that the economic and social changes which have come within this time are quite as great as the improvement in health.

Results in Eleven States

The service inaugurated in 1910 in Richmond county was extended rapidly to the more heavily infected counties of eleven southern states. Results similar in character—though less on the average in degree of control—have been accomplished throughout this infected region. Resurveys carried out on a county-wide scale, and based on the examination of school children—as were the original infection surveys

of 1911–1914—have been completed in fifty-six counties; more than 29,000 children have been examined in these recent tests. The results show, for the fifty-two counties for which comparative records are now available, a decline in the average infection rate from 57.8 per cent in 1911–1914 to 27.7 per cent in 1920–1921. The change wrought in the physical appearance of the people is obvious even to the casual observer. As in Richmond county, so over the larger region, typhoid and dysentery also are being brought under control (see Fig. 26).

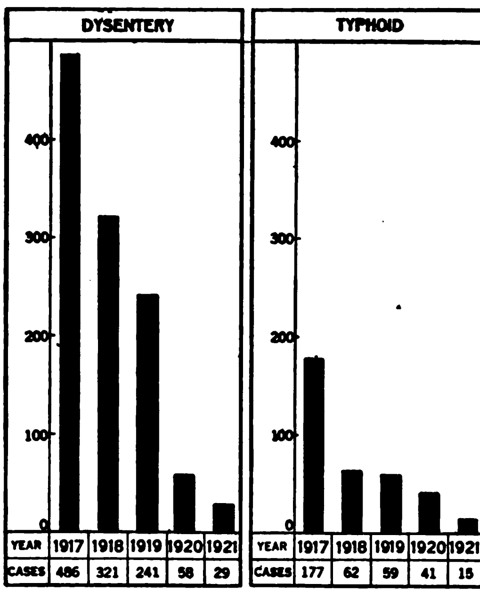


Fig. 26.—Decline in incidence of dysentery and typhoid fever, Troup county, Georgia, 1917–1921, inclusive. The prevention of soil contamination, brought about through the work of the county health departments, accomplishes not only the control of hookworm but of other soil-borne diseases as well

The point to be emphasized is that although the original intensive demonstrations in which nearly

three fourths of a million people were treated in these states contributed to the immediate reduction of the infection both in degree and in prevalence, the results have been accomplished in the main by permanent local agencies rooted in the soil. These forces are continually active, are committed to the task, and may be depended upon to complete it.

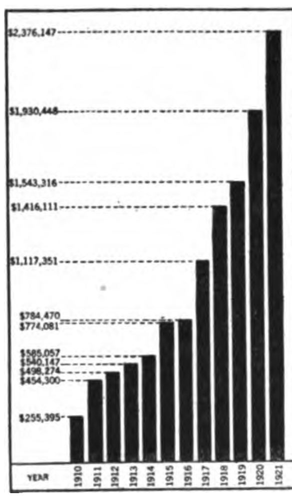


Fig. 27.—Appropriations of legislatures to state boards of health in eleven southern states 1910–1921. Includes funds for anti-tuberculosis work

Board's Work Completed

The object which the Board had in view has been accomplished. During the year the arrangement by which the Rockefeller Sanitary Commission and later the International Health Board had shared with the states in measures for the relief and control of hookworm disease was brought to a satisfactory close. Heads of health departments have seen develop in these states, in response to their efforts, a strong public sentiment in support of sound and aggressive public health policy. State legislative appropriations for health purposes have increased more than

nine-fold during the eleven years (see Fig. 27, page 126). County health departments supported in the main by county funds have developed and are developing more rapidly than it has been possible to provide properly trained men (see Fig. 65, page 206).

Termination of the Board's participation in measures directed specifically to the control of hookworm disease does not disturb working relations with these states. It makes possible rather a transfer of funds to the further development of the more general county health program, to the fight against malaria, and to the training of personnel for the technical and administrative positions which are being created.

Testing Results in Brazil

With a view to testing the effectiveness of field operations in Brazil Dr. W. G. Smillie, Director of the Institute of Hygiene at São Paulo, made a resurvey during the year in two communities within the Federal area. The test was based on worm counts. Though the usual microscopic examination of stools showed but slight reduction in the percentage of persons infected in either of these communities, the number of parasites expelled showed a striking result. In one of the two communities where latrine construction had not been thorough the group that had been treated

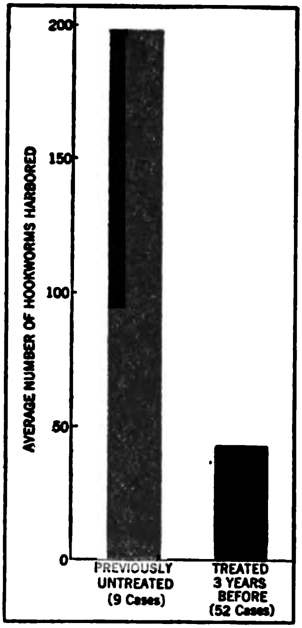


Fig. 28.—Control of hookworm disease as result of campaign measures applied in 1918 in Jacarepagua, Brazil. In that year the infected inhabitants harbored on an average approximately 200 worms; in 1921 they harbored only forty-two

at the time of the original demonstration harbored on the average forty-two parasites per person, while a group that had escaped

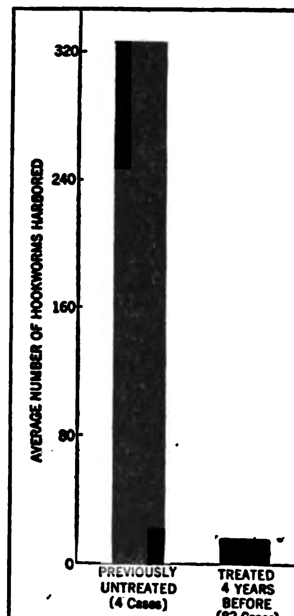


Fig. 29.—Reduction of hookworm disease as result of control measures, Governor's Island, Brazil. (In this graph and in Fig. 28 the cases represented by the bar "Previously Untreated" are few in number because the population of both places is largely transient. No considerable number of persons could be found in 1921 who had lived there and had not been treated at the time of the original campaigns in 1917–1918)

treatment averaged approximately 200,—a reduction of 79 per cent. In the other community where latrine construction had been more thorough the test indicated that the original campaign, with

the continued operation of local forces, had within four years' time reduced by 95 per cent the number of hookworms harbored (see Figs. 28 and 29, page 128).[1]

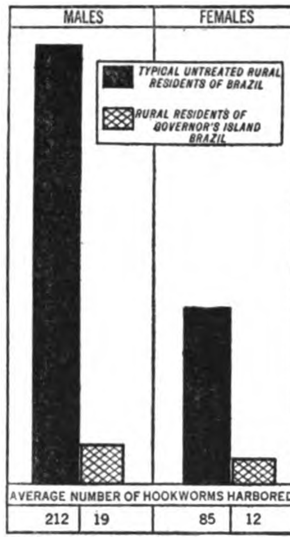


Fig. 30.—Effect of treatment and the installation of latrines on severity of hookworm infection. Worms harbored by typical untreated rural residents of Brazil compared with those harbored in 1921 by the rural residents of Governor's Island, who were treated three years previously

Transferring Responsibility to Brazilian Government

The work inaugurated in 1916 in the state of Rio and rapidly extended to the Federal area and eleven states is being taken over by government authorities as part of a permanent scheme of rural sanitation. For this purpose appropriations, state and federal, have increased from $12,556 in 1917 to $2,072,500 in 1921 (see Fig. 31, page 130). The Board is gradually transferring its funds from demonstrations in hookworm control to the development of a county health organization; the introduction of a public health nursing service;[2]

[1] For details, see The Results of Hookworm Disease Prophylaxis in Brazil, by Wilson G. Smillie. *The American Journal of Hygiene*, January, 1922, v. 2, No. 1, pp. 91–94. Same reprinted.

[2] See page 153.

field experiments in the fight against malaria; and the development of a school of public health.[1] An arrangement has been entered into—the state, the county, and the Board providing the funds—for the first demonstration of county health service in the state of São Paulo.

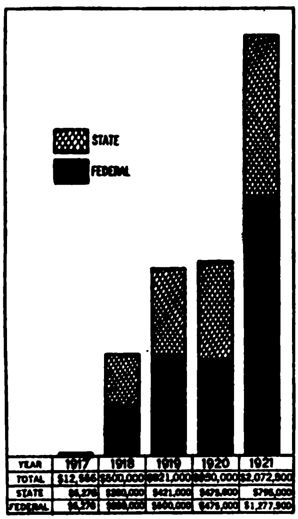


Fig. 31.—Increase in funds for rural sanitation appropriated by Federal and local governments in Brazil, 1917–1921

Progress in Permanent Sanitation in the West Indies

An illuminating field study carried out in Trinidad during the year by Cort and Payne[2] proved to be a striking demonstration of the effectiveness of the measures that are being carried out on a large scale in many lands, and particularly of the soundness of government policy in building up sanitary organizations to make the results permanent.

Governments are becoming increasingly active in Dutch Guiana, British Guiana, Trinidad, Porto Rico, and Jamaica, in providing funds, increasing their sanitary staffs, and in carrying out

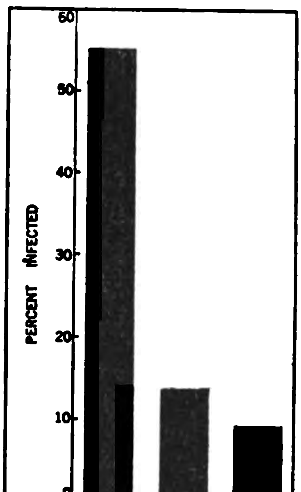
[1] See page 144.
[2] Summarized on pages 175 to 180.

practical operations in the field. For the year 1921 Porto Rico appropriated $800,000 for public health purposes, including a tuberculosis sanatorium; set aside $30,000 of this—in addition to the necessary overhead—for the fight against hookworm disease; and with an efficient field staff under central direction established a creditable standard of soil sanitation in all areas of operation well in advance of the mobile clinics. The present field staff is to be the nucleus of a permanent system of inspection.

Fig. 32.—States of Brazil that have funds available for a program of rural sanitation. Most of the states are receiving Federal aid

In **Trinidad** Government has committed itself to the support of a general scheme of public health; has recently appointed one medical officer of health with provision for a second; has inaugurated a comprehensive plan of malaria control; is providing about $35,000 a year for the maintenance of its sanitary staff; has recently added to it three European inspectors; and has in progress an extensive program of latrine construction. In

Dutch Guiana, where only recently operations were resumed after enforced suspension during the war, Government is giving energetic support; has provided a staff of sanitary inspectors for Lower Surinam and Lower Pará; and with the hearty co-operation of the estates population is effecting a thoroughgoing reform in these regions.



	FIRST SURVEY	SECOND SURVEY	THIRD SURVEY
EXAMINED	2303	1689	1618
INFECTED	1269	229	149
PERCENT INFECTED	55.1	13.6	9.2

Fig. 33.—Reduction of hookworm infection rate on estates in the Vere area, Jamaica. First survey, November, 1919; second survey, May to October, 1920; third survey, August, 1921. The estate management is continuing systematic treatment and also installing latrines in an effort to stamp out the infection

In **Jamaica** the harassing—and at times apparently hopeless—inertia that early effort in the island had to face has yielded to a popular interest that is becoming increasingly general and aggressive. A striking demonstration in one community shows a fall in infection rate from 55 per cent in 1919 to 13 per cent in 1920, and to 9 per cent in 1921 (see Fig. 33). Areas of operation are now being sanitated in advance of treatment. A conference of parochial boards in December adopted a resolution

approving the appointment of a superintending medical officer for the colony and a whole-time health officer in each of the parishes, with adequate field staff to establish a system of inspection. Government is preparing to expend $100,000 on sanitation during the year 1922.

Developing National Health Organization in Central America

In Central American countries—and particularly in Costa Rica, Nicaragua, and Salvador—measures undertaken in 1914 and 1915 against hookworm disease have passed successfully through the primary stage of field demonstration. Responsibility is being gradually transferred to government authorities, and control of the one disease is being merged into more general schemes of public health. In **Panama,** where development of local initiative has been stifled by the paternalistic policy of the Canal Zone, the formation of a responsible department of health is now being considered. Government is slowly developing a sanitary staff and is providing $12,500 a year for the work of the department of uncinariasis, or hookworm control.

In **Costa Rica** the service was formally taken over on May 28, 1921, as a division under the newly established national department of health,

and the Board's representative was withdrawn. A limited contribution toward its maintenance is being continued through 1922, and provision has been made by means of fellowships for the training of additional men for the posts that are being created. In **Nicaragua** a commission appointed for the purpose by the President has drafted a sanitary code for the country and a law establishing a national department of health to carry it out. The Board is lending the services of a trained scientist to organize and direct a modest diagnostic laboratory, and is providing for the training of a limited number of native doctors for the new government service. The division of uncinariasis is to be the nucleus around which the new department is to be formed.

Salvador has had a national health organization for many years. During the year Government has reconstituted it in the interest of more aggressive action in the field. The new scheme correlates the various government medical services under central control; provides new and adequate quarters; reinforces the staff; creates a public health laboratory; takes over as one of its divisions uncinariasis control; and provides an annual budget of 170,000 colones, in addition to supplying 26,000 colones for the relief and control of hookworm disease and half the funds needed for the fight against yellow

fever. The Board undertakes to aid in the training of additional men.

Promoting Public Health in the Far East

In the Far East the Board is sharing in a wide range of activities representing pretty well all stages of public health development. In **Borneo** the first demonstration in the control of hookworm opened with Government supplying a large part of the funds and the native population giving willing co-operation. In **Fiji**, where operations had been suspended during the war, adequate latrine accommodations were installed over a wide area preparatory to reopening the clinics early in 1922. Government is to assume entire responsibility at the end of three years. The infection survey of **Mauritius**—completed in 1920—led to an arrangement by which the Board is to share on a sliding scale for a period of three years in a series of demonstrations in control measures, leaving Government at the end of that time in full charge. In the meantime aid is being given in the training of local men. In **Madras Presidency, India,** where surveys made between 1915 and 1920 showed a rate of nearly 100 per cent among the laboring population, a scheme of practical operations for the Presidency has been approved, Government supplying all necessary funds save the salary and traveling expenses of

the director. In the face of a sharp economic crisis in **Ceylon** operations are continuing, although on a diminished scale. A proposed revision of the sanitary law is indication of an interest in a more aggressive public health policy for the colony.

In **Siam** the National Red Cross is taking a leading part in the fight against hookworm disease. Government has enlisted the army, the navy, the gendarmerie, and the local chiefs. For more than a year the dispensaries have been treating on the average more than 1,000 persons per week; and an active propaganda has created a demand that the service be made national in scope. Plans are now under consideration for putting the medical school at Bangkok on a modern basis as a necessary first step toward the training of Siamese for public health work.

The five-year scheme entered into with **Australia** in 1918 is now being operated under the new Commonwealth Ministry of Health which was created last year. The services of Dr. W. A. Sawyer, the Board's representative, are being lent to the Ministry for a limited time; Dr. A. J. Lanza has gone out to organize a division of industrial hygiene; Mr. F. F. Longley is to set up a division of sanitary engineering; and Dr. F. F. Russell, of the Board's staff, is to make a brief visit toward the end of 1922 to aid

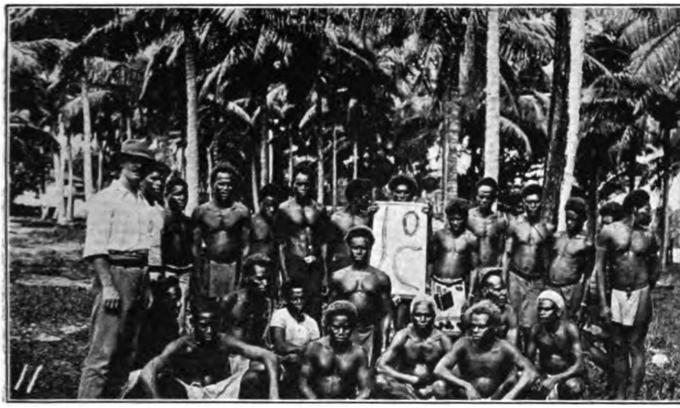


Fig. 34.—Carrying the gospel of sanitation to the natives of Solomon Islands. Plantation group assembled for lecture on hookworm disease at Rendova

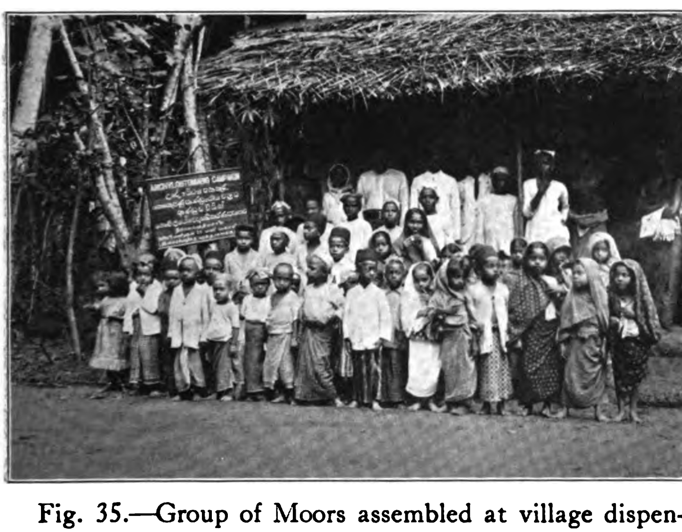


Fig. 35.—Group of Moors assembled at village dispensary to be treated for hookworm disease. After witnessing the results of five years' demonstration work among the Tamil estate population, large numbers of Moors are now voluntarily applying for treatment

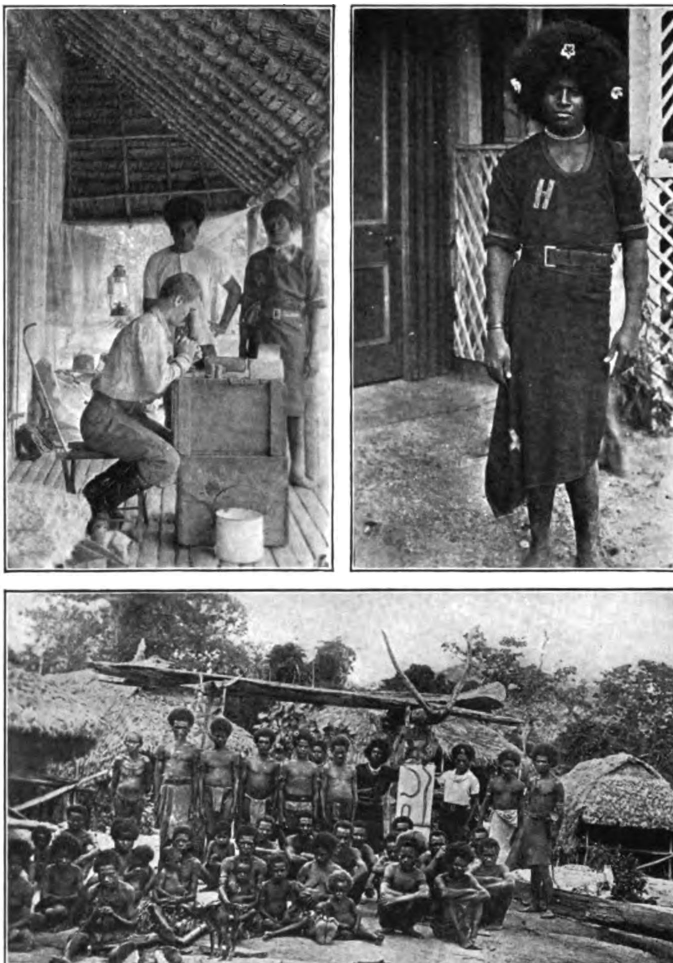


Fig. 36. Three phases of field operations against hookworm disease in Papua. *Upper left:* medical officer examining fecal specimen for hookworm eggs, Yule Island; *upper right:* native assistant in uniform of hookworm campaign staff; *below:* group of natives assembled to hear lecture, Sabuia

in the planning of a system of public health laboratories. In the meantime young Australians are being trained for these positions.

Just at the close of the year comes a call from the **Philippines.** In response to Government request the Board has undertaken to lend the services of Dr. Heiser, Director of its work for the East, for a period of three months; to provide a competent woman to aid in developing a public health nursing service for the Islands; to provide, for two years, a trained director for the public health laboratory in connection with the Bureau of Science; to detail a specialist to carry out a malaria survey; and to provide by means of fellowships for training a limited number of Filipinos in public health.

On Their Own Initiative

The year has brought reports of government and voluntary effort against hookworm disease in which the Board has not shared. Reference has been made in previous reports to the admirable work done in Assam under the direction of Colonel Sir Clayton Lane and to the eminent achievements of Schüffner and his colleagues in Sumatra. Paraguay took up the task two or three years ago; and now the Egyptian government is resuming operations which had been suspended during the war. Dr. Gann, Principal

Medical Officer of British Honduras, has completed a campaign extending over a period of three years and covering systematically the infected areas of the country. The infected have been treated; latrines have been provided, and the people have been taught to use them. It is now proposed to make the results permanent by a system of sanitary inspection. The report from British Honduras forces upon the reader the thought that if government medical officers everywhere had the public health point of view and something of Dr. Gann's aggressive energy, many of the cases of illness that are being treated in expensive hospitals would not occur.

Greater Speed and Economy in Field Operations

Results of the studies by Darling and Smillie in the administration of treatment for hookworm disease, and the more recent resurveys based on worm counts made by Smillie in Brazil, suggest important modifications in field procedures.

The findings of Smillie in Brazil and of Cort and Payne in Trinidad, for example, put beyond further question the value of mass treatment even when considered merely as a prophylactic measure. It is now known that by administering two standard doses of oil of chenopodium as a routine measure about 95 per cent of the parasites harbored by the people of a

community may be expelled. To attempt to get rid of the remaining 5 per cent by following each case to a complete cure would double the cost. By leaving this small fraction of infection—which is not of great clinical importance—to be taken care of by sanitation, it has been found possible greatly to reduce the cost and increase the speed of field operations. A preliminary comparative test in Brazil indicates a saving by this modification of about 50 per cent in per capita cost.[1]

Field Studies in Hookworm Control

Reference has been made above to two or three studies that have been extremely fruitful in practical results. In this field 1921 has been the most productive year in the history of the Board. Colonel Sir Clayton Lane, with a small subvention, has been seeking to improve the technique of stool examination. Beta-naphthol has been given a further test as an anthelmintic on an extensive scale and under field conditions by Mhaskar and Kendrick in India. Ascaridol has been administered on a relatively small scale and with good results by Smillie in Brazil, Mhaskar[2]

[1] For details of working plan suggested by Dr. Smillie see pages 180 and 181 of this report; and Dr. Smillie's article "The Result of Hookworm Disease Prophylaxis in Brazil"; published in *The American Journal of Hygiene*, January, 1922 (v. 2, No. 1, p. 77–95).

[2] Working under the Indian Research Fund.

in India, and Molloy in Nicaragua. The administration of chenopodium without preliminary purge has been further tested under field conditions in Australia, Costa Rica, Panama, Salvador, and Colombia. The practice is becoming general. Dr. Washburn in Jamaica reports continued satisfactory results from the use of compound jalap powder. The most interesting contribution in the field of treatment is by Dr. M. C. Hall[1] of the Department of Agriculture, Washington, D. C., in administering carbon tetrachloride to dogs with 100 per cent efficiency for hookworms. The Willis salt-flotation method of stool examination has been tested on an extensive scale in the field and found to be efficient, rapid, and economical. Molloy of Nicaragua contributed an important improvement. Smillie finds that counting eggs on the slide as a means of estimating severity of infection, while serving as a rough indication when large groups are considered, is of small value in individual cases. Cort developed an improved apparatus for the recovery of hookworm larvae from the soil, and Smillie made an important contribution to the technique of differentiating hookworm and Strongyloides larvae. Dr. Caldwell, in Panama, completed a study of the relation of the action of sea-water on hookworm eggs and

[1] No connection with Board's staff.

larvae to the extremely light infection among the San Blas Indians living by the sea.

A small subvention by the Board made it possible for Dr. Cort, helminthologist in the Hopkins School of Hygiene, to go with a competent staff to Trinidad, British West Indies, for a series of field investigations covering a period of about four months. It proved to be an extremely fruitful expedition. The results, throwing much-needed light on practical control operations, are being published in the form of ten papers appearing serially in the American Journal of Hygiene.[1]

V

Developing Schools of Hygiene

In the autumn of 1913, soon after the beginning of operations on an international scale, the Board faced the fact that in order to carry out the activities it had undertaken it must have a staff of trained hygienists; and that the countries in which it was proposed to encourage public health development must also have such men. The men even for the Board's own staff were not then available. Institutions for their proper training—that is, institutions covering broadly the whole field of hygiene, and equipped to culti-

[1] For a more detailed summary of the field studies referred to in this section, see appendix, pages 175 to 186.

vate it as a science and to train men in its application as an art—had to be developed. The outcome was a direct contribution to the Johns Hopkins University to establish the Hopkins School of Hygiene and Public Health. The school, now in its fourth year, enrolled during the year 1920–1921, 122 students.

Since 1917 the Board has been contributing toward the development on a very modest scale of an institute of hygiene in connection with the medical school at São Paulo, Brazil. This institute gives an undergraduate course in hygiene to the students in the medical school; conducts short training courses for public health officers; carries out epidemiological field studies for the state; and has done an extremely creditable amount of productive scientific work. During the year the Board pledged about 27,000,000 crowns toward the establishment of an institute of hygiene at Prague. This institute, under the Ministry of Health and in close relation to the University Medical School, is to combine a central public health laboratory for Czechoslovakia with a school of instruction for public health workers. As a result of conferences between the officers of the Board and the authorities of Harvard University and its medical school during the early months of the year, plans were matured and approved by which the Rockefeller Founda-

tion agreed to contribute the sum of $2,160,000 toward the further development of the Harvard School of Public Health. The resources now available are regarded as quite adequate for its immediate needs.

Fellowships in Hygiene and Public Health

In accordance with the policy illustrated in the foregoing section the Board contemplates contributing from time to time, as conditions may favor, toward the development of a limited number of schools of hygiene at strategic points throughout the world. As these institutions develop they will necessarily serve to stimulate and reinforce each other by interchange of experience, facilities, and men. The migration of students in the field of public health will then be feasible on a much more satisfactory scale than is possible under present conditions. In the meantime, however, the Board is taking advantage of the facilities now offered in England, the United States, and, by recent arrangement, in Canada, for the training of students from their own and other lands; and has provided by means of fellowships for a limited number of students to pursue courses in these countries. Fellowships have been granted to students who have been carefully selected with reference to their fitness for important posts as scientists, teachers, or practi-

cal administrators in the public health service, to which in most cases they have had definite assurance of appointment on completion of their courses. These fellowships are regarded as an investment in leadership. For the year 1921 fellowships were provided for fifty-four men and women from thirteen countries, as follows:

Brazil.........5	Czechoslovakia.19	Nicaragua.... 2
Canada........2	France........ 4	Poland....... 3
Ceylon........1	Guatemala..... 1	Salvador...... 2
Colombia......1	Mexico........ 1	United States.11
Costa Rica....2		

Extension Courses in Public Health

The well-established schools of hygiene will give short courses for health officers. Under most favorable conditions, however, only a very limited number can be expected to attend these institutions. Each state will find it necessary to provide practical courses for the better training of its own workers. Modest beginnings in this direction are being made in the form of training centers of limited scope, correspondence courses, and institutes. During the year the Board has contributed toward institutes for health officers in Georgia, Ohio, Michigan, and Alabama; toward three institutes for public health nurses in New York state; and toward the organization of a correspondence course to be conducted by the Ohio department of health for full-time county health officers in that state.

Fig. 37.—Counting hookworms expelled by treated patients. Field research conducted under the auspices of the Department of Hygiene of the São Paulo Medical School

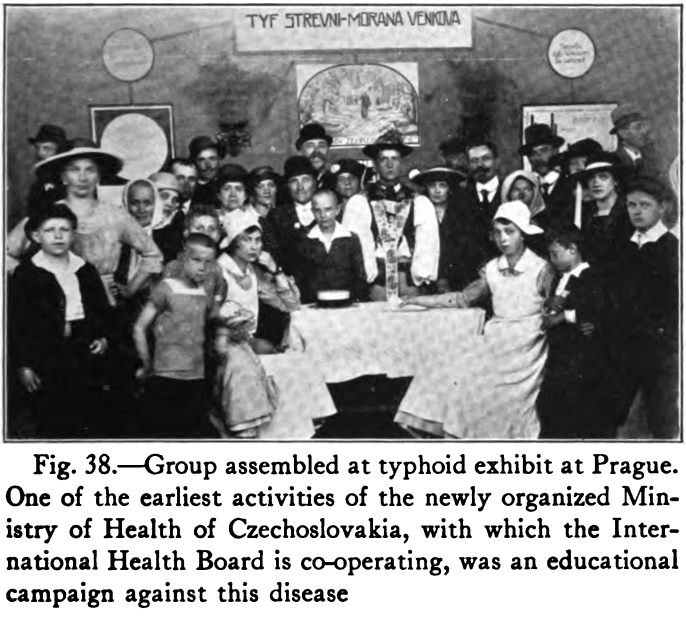
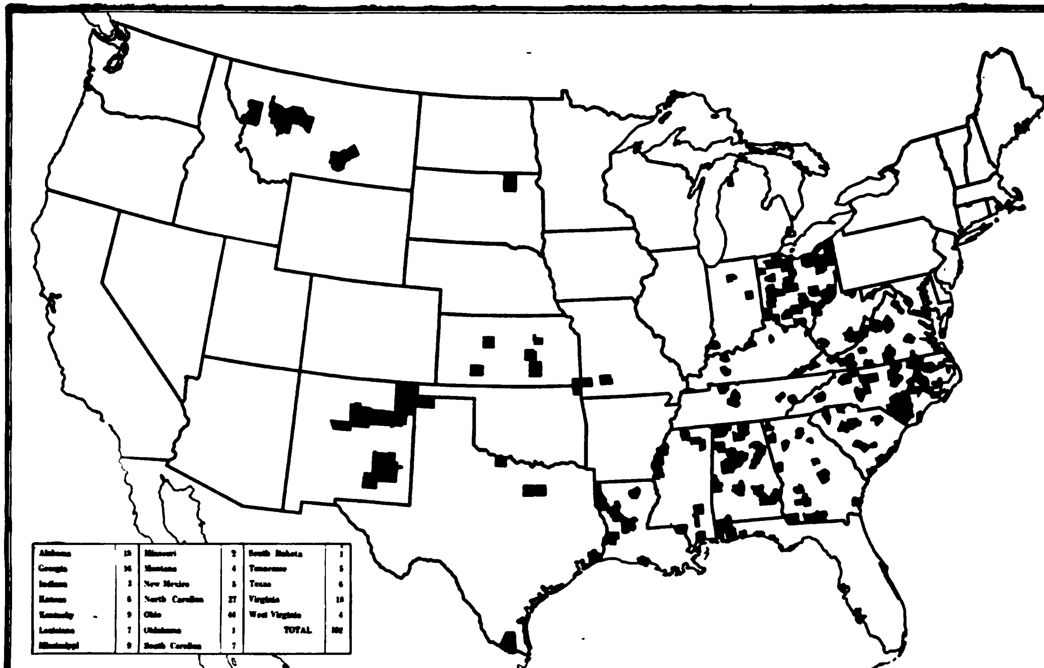


Fig. 38.—Group assembled at typhoid exhibit at Prague. One of the earliest activities of the newly organized Ministry of Health of Czechoslovakia, with which the International Health Board is co-operating, was an educational campaign against this disease



Alabama	13	Missouri	2	South Dakota	1
Georgia	16	Montana	4	Tennessee	5
Indiana	3	New Mexico	5	Texas	6
Kansas	6	North Carolina	27	Virginia	15
Kentucky	9	Ohio	66	West Virginia	4
Louisiana	7	Oklahoma	1	TOTAL	[illegible]
Mississippi	9	South Carolina	7		

Fig. 39.—Counties having full-time health officers at close of 1921

VI

Promoting County Health Work

For reasons which are well understood public health effort has been centered mainly on the larger towns and cities. Health protection for the people living in country districts has been neglected. The tide is turning. The development of county health organization—which is now going forward with considerable momentum in the United States—is providing a service for the smaller towns and rural communities.

In the Southern States county health administration developed naturally and inevitably from the effort to control hookworm disease. This is a rural disease; its control is a problem in rural sanitation; a serious effort to handle this one problem in rural sanitation called into being county organization. County organization once established, control of hookworm disease became merely an item in a general health program under state and county administration. The demonstration thus given of the value of the county as a unit in the state scheme stimulated a movement which is becoming general. At the close of the year county programs on a full-time basis were in operation in about 192 counties in the United States (see map, page 148).

The Board and the United States Public Health Service are aiding this movement by contributing toward a limited number of demonstrations. The average county health budget is about $10,000, and is provided from state and county funds. When the Board shares in a demonstration, it contributes toward a central budget or from $1,000 to $2,500 toward the county budget. During the year 1921 aid was thus given in sixteen states: Alabama, Florida, Georgia, Kansas, Kentucky, Louisiana, Maryland, Mississippi, Missouri, New Mexico, North Carolina, South Carolina, Tennessee, Texas, Virginia, West Virginia. A similar demonstration is being carried out in Czechoslovakia and in the state of São Paulo, Brazil.

Experiment in County Health Administration

The county program, which is essentially a scheme of rural public health work, is, for the United States, a new undertaking. It invites critical study and experiment. A joint arrangement has been entered into by the Hopkins School of Hygiene, the Maryland State Department of Health, the United States Public Health Service, and the International Health Board by which such an attempt is to be made. The arrangement provides for a full-time service in a county easily accessible to Baltimore and under

the immediate direction of a county health officer reporting to the head of the state service. Washington county has been selected for the purpose and is to contribute to the budget. The county is expected to serve as a field laboratory for the school, and to provide opportunity for investigation and for possible contribution to the development of a sound plan of health activities for rural communities. In so far as the undertaking succeeds it will serve as a demonstration and as a training base for students.

VII

Making Public Health Laboratories More Serviceable

A laboratory service — like vital statistics —is fundamental to intelligent public health administration. The trained health officer, however, understands that the provision of buildings, equipment, and scientifically trained men does not of itself provide the service he needs. Aggressive administration is equally necessary to make these facilities available to the people they are supposed to serve and to educate the doctors and people to use them. Under Dr. F. F. Russell, Director of Public Health Laboratory Service the Board has shared during the year in an increasing number of projects designed to promote this end.

Dr. Russell, while in Europe in connection with plans for the Institute of Hygiene at Prague, made brief visits for his own information to the public health laboratories at the three universities of Austria and some of the principal institutes of hygiene in France—at Nancy, Lyons, Montpellier, and Paris. These laboratories are doing a high order of technical work and are capable of doing a greater amount of it than is being required of them by the physicians of the regions they serve. Assistance was given in Alabama in adapting the state service to the larger opportunities opened up by a new and adequate laboratory building. Arrangement was made for the heads of the laboratory divisions in Alabama and Mississippi to visit the laboratories in other states and to observe the work of institutions where sera and vaccines are produced on a large scale. The state laboratories in Tennessee and West Virginia were visited for consultation regarding possible future developments. During the summer months Dr. Russell visited Panama, Central America, and Mexico. In Nicaragua arrangements were made for a diagnostic laboratory as part of the newly created national health service. In Salvador a national laboratory has been established under the department of health and is being organized by Dr. Segovia, who had been in

training for this purpose on a fellowship granted by the Board. In Guatemala a first step in the direction of a diagnostic laboratory has been made by adding to the equipment and staff of the central laboratory used in the hookworm work. In Mexico Government has plans for a national institute of hygiene. Here the Board has served as agent for Government in finding a suitable American to direct the enterprise for a limited period.

VIII

Establishing a Public Health Nursing Service in Brazil

During the latter part of 1920 the federal health service of Brazil became a national department of health with greatly enlarged powers and resources. The new department, with Dr. Carlos Chagas as its distinguished head, has undertaken among other things a nation-wide program in rural sanitation to be carried out by joint arrangement with the states; and for the Federal District is setting up new divisions for child welfare, venereal disease control, and a crusade against tuberculosis. These activities have made acute the need of trained public health nurses. To meet the situation Government is establishing a training school in Rio de Janeiro. The Board has undertaken to assist in securing a

competent corps of American nurses to operate the field dispensaries and the training school for a period of three years. In the meantime a selected group of Brazilian women are to be trained with a view to taking over the responsibility. A limited number of dispensaries are in operation and plans have been completed for opening the training school early in the coming year. Arrangements have been made for recruiting the student nurses from the best graduates of the normal schools.

IX

Laying Foundations in Czechoslovakia

The Ministry of Health in Czechoslovakia, confronted with the task of creating a new service for the country, is showing great wisdom in undertaking the training of a staff of selected young men to develop and administer it. In accordance with plans matured in Prague in February, 1920, and approved by the International Health Board the following May, provision was made for a commission representing the Ministry to study public health administration in England and the United States. After the return of the commission early in the year 1921 the Ministry set up a committee to undertake a critical revision of its own plans and procedures. In the

general scheme which is being put into operation first consideration is being given to a few fundamentals: (1) a reporting and statistical service that shall provide the information which the Ministry and local health officers need for their daily guidance; (2) a public health laboratory service that shall make its facilities available to all the people of the country; (3) effective control of the ordinary communicable diseases; (4) provision of wholesome water supplies; (5) protection against contaminated milk; and (6) an institution for the adequate training of personnel. The Board at its meeting in May appropriated approximately 27,000,000 crowns toward the buildings and equipment of an institute of public health at Prague; and provided by means of fellowships for the training of twenty-two young Czechoslovaks for staff positions in this institute and for the administrative services outlined above.

Publications

During the year 1921 the following reports and publications were issued by the International Health Board:

Annual Report for the Year 1920.

Infant Mortality in New York City. By Ernst Christopher Meyer, Ph.D.

Staff members and others directly associated with projects in which the Board participated

made the following contributions to medical and public health literature, most of them in the form of articles published in medical journals that are widely circulated among persons interested in medical and public health topics:

Bass, C. C.

Diagnosis of the commoner intestinal parasitic infections. *Southern Medical Journal*, Nov., 1921, v. 14, p. 863–865.

Standard treatment for malaria. *Public Health Reports*, July 1, 1921, v. 36, p. 1502–1504.

The standard treatment for malaria—a discussion of some of its advantages. *Southern Medical Journal*, Apr., 1921, v. 14, p. 280–288.

Connor, M. E.

Fish as mosquito destroyers; an account of the part they played in the control of yellow fever at Guayaquil, Ecuador. *Natural History*, 1921, v. 21, p. 279–281. Same reprinted.

Cort, W. W.

Investigations on the control of hookworm disease; general introduction. *American Journal of Hygiene*, Sept.–Nov., 1921, v. 1, p. 557–568.

Cort, W. W., D. L. Augustine, and G. C. Payne

Investigation on the activities of infective hookworm larvae in the soil; preliminary report. *Journal of the American Medical Association*, Dec. 24, 1921, v. 77, p. 2035–2036.

Darling, S. T.

The tertian characters of quotidian aestivo-autumnal fever. *American Journal of Tropical Medicine*, Nov., 1921, v. 1, p. 397–408.

Darling, S. T. and W. G. Smillie

Studies on hookworm infection in Brazil; first paper. N. Y., Rockefeller Institute for Medical Research, 1921. (Monograph no. 14.)

Technic of chenopodium administration in hookworm disease. *Journal of the American Medical Association*, Feb. 12, 1921, v. 76, p. 419–420. Same reprinted.

Ferrell, J. A.

Careers in public health service. *Journal of the American Medical Association*, Feb. 19, 1921, v. 76, p. 489–492. Same reprinted.

Measures for increasing the supply of competent health officers. *Journal of the American Medical Association*, Aug. 13, 1921, v. 77, p. 513–516. Same reprinted.

GREGG, ALAN

Inspecção sanitaria da Commissão Rockefeller no estadedoParaná. *Archivos paraenses de Medicina*, Curityba, Jan., 1921, v. 1, p. 273-276.

Inspecçãe sanitaria da Commissão Rockefeller em Santa Catharina. *Archivos paraenses de Medicina*, Curityba, May, 1921, v. 2, p. 11-16.

GUITERAS, JUAN

Observations on yellow fever in a recent visit to Africa. *Sanidad y Beneficencia*, Habana, Jan.-Mar., 1921, v. 25, p. 34-43.

HACKETT, L. W.

Os cinco annos da Commissão Rockefeller no Brasil. *Boletim da Academia Nacional de Medicina*, Rio de Janeiro, 1921, v. 93, p. 62-73.

HARRISON, A. P.

Oil field sanitation. *Texas Municipalities*, Sept.-Nov., 1921, v. 8, p. 108-111.

HEGNER, R. W. AND G. C. PAYNE

Surveys of the intestinal protozoa of man in health and disease. *Scientific Monthly*, Jan., 1921, p. 47-52. Same reprinted.

LAMBERT, S. M.

Intestinal parasites in North Queensland. *Medical Journal of Australia*, Apr. 23, 1921, p. 332-335. Same reprinted.

LEPRINCE, J. A.

Co-operative anti-malaria campaigns in the United States in 1920. *Southern Medical Journal*, Apr., 1921, v. 14, p. 297-306.

NOGUCHI, HIDEYO

Prophylaxis and serum therapy of yellow fever. *Journal of the American Medical Association*, July 16, 1921, v. 77, p. 181-185.

Recent experimental studies on yellow fever. *American Journal of Hygiene*, Jan., 1921, v. 1, p. 118-129. Same reprinted.

NOGUCHI, HIDEYO AND I. J. KLIGLER

Experimental studies on yellow fever in northern Peru. *Journal of Experimental Medicine*, Feb. 1, 1921, v. 33, p. 239-252. Same reprinted.

Immunology of the Peruvian strains of *Leptospira icteroides*. *Journal of Experimental Medicine*, Feb. 1, 1921, v. 33, p. 253-260. Same reprinted.

NOGUCHI, HIDEYO AND WENCESLAO PAREJA

Prophylactic inoculation against yellow fever. *Journal of the American Medical Association*, Jan. 8, 1921, v. 76, p. 96-99.

SAWYER, W. A.

Hookworm in Australia. *Medical Journal of Australia*, Feb. 19, 1921, p. 148-150. Same reprinted.

Team work in sanitation. *Medical Journal of Australia*, Apr. 9, 1921, p. 285-287. Same reprinted.

SEDGWICK, W. T.
Modern medicine and the public health. *Public Health Reports*, Jan. 28, 1921, v. 36, p. 109–116.

SMILLIE, W. G.
Comparison of the number of hookworm ova in the stool with the actual number of hookworms harbored in the individual. *American Journal of Tropical Medicine*, Nov., 1921, v. 1, p. 389–395.

SOUZA, G. H. DE PAULA
Sanitary propaganda in Brazil. *Bulletin of the Pan American Union*, Apr., 1921, v. 52, p. 364–366.

STUART, EDWARD
Popular health instruction. *International Journal of Public Health*, Mar.–Apr., 1921, v. 2, p. 152–163.

VAN DINE, D. L.
The destruction of anopheles in screened dwellings. *Southern Medical Journal*, Apr., 1921, v. 14, p. 289–296.

VINCENT, G. E.
Passing of the country doctor. *Forum*, Oct., 1921. Reprinted with the title, Modern tendencies in medical education and practice.
World health and the Rockefeller Foundation. *Nation's Health*, May, 1921, v. 3, p. 270–272.

WARREN, A. J.
General outline of a comprehensive plan of rural health work. *Kansas State Board of Health, Bulletin*, May, 1921, v. 17, p. 84–87.

WILLIAMS, L. R.
Some problems of nursing education. *New York State Department of Health, Health News*, Sept., 1921, v. 16, p. 189–197.

WILLIS, H. H.
Simple levitation method for the detection of hookworm ova. *Medical Journal of Australia*, Oct. 29, 1921, p. 375–376. Same reprinted.

WYATT, B. L.
Review of the work of the medical bureau of the Commission for Prevention of Tuberculosis in France, July 9, 1917—Dec. 30, 1920. Paris, 1921.

APPENDIX

11

ACKNOWLEDGMENT

Extensive use has been made of the following special articles and reports in compiling the appendix, particularly the sections dealing with hookworm disease and malaria:

"Investigations on the control of hookworm disease," by W. W. Cort, D. L. Augustine, J. E. Ackert, F. K. Payne, and G. C. Payne. *The American Journal of Hygiene*, Baltimore, September–November, 1921, v. 1, Nos. 5 and 6; January, 1922, v. 2, No. 1; March, 1922, v. 2, No. 2.

"Anti-Hookworm Campaigns in Southern India," by J. F. Caius, K. S. Mhaskar, and J. F. Kendrick. In manuscript.

"Report Covering Experiments in Malaria Control," by C. C. Bass. In manuscript.

In certain instances the authors' own words have been used. The Board is indebted to these as well as to many other members of the staff for contributions in the form of reports and articles which have made possible the following statement of findings and results.

APPENDIX

I

EXTENT AND SEVERITY OF HOOKWORM DISEASE

INVESTIGATIONS IN INDIA

Early in 1915 the Indian Research Fund Association decided to devote a share of its attention to the subject of hookworm infection in India. Its first inquiry, under the auspices of Colonel Sir Clayton Lane, was carried out in the tea gardens of the Darjeeling district during the winter months of 1915 and 1916. Later, or from October, 1916, to March, 1917, a similar inquiry was conducted among the coolies collected at the emigration depot at Negapatam. In April, 1917, the locale of the investigation was transferred to Dindigul (see map, page 162), and additional work was undertaken in Trichinopoly jail. The work in Dindigul was closed on May 24, 1919, and the staff moved to Trichinopoly, where, until December, 1921, they continued to devote themselves exclusively to investigations into the prevalence and severity of hookworm infection and the factors necessary for its control.

Inauguration of Control Operations. The early investigations having satisfied the authorities of Madras that the infection brought about much physical suffering and economic loss within the Presidency, Government determined to carry out an active campaign against the disease. Upon invitation the Board lent medical officers, in the beginning Dr. George P. Paul and later Dr. John F. Kendrick, to assist in the work, and on April 7, 1920, control operations were undertaken at the Cannanore jail. This piece of work was completed on June 26, 1920, and the following month examination and treatment were begun among the labor forces on the Wynaad-Nilgiri tea estates. Effort continued here until November 15, 1920, when control measures were inaugurated among the employes of the Buckingham and Carnatic mills in the city of Madras. In June, 1921, the staffs of Madras and Trichinopoly joined hands and carried out two experimental campaigns among coolies of the Mudis and Kalyanapandal tea estates in the Coimbatore district.

Prevalence of Infection in Madras Presidency. From the inception of the work in Negapatam in 1916 until the close of the year 1921, a total of 19,239 persons were examined: 16,743 in villages, towns, and rural areas, and on estates; and 2,496 in the city of Madras. In the areas exclusive of Madras city, 97.1 per cent of all persons exam-

ined were found to harbor hookworms; in Madras city, 63.6 per cent. Conditions extremely suitable for the development of the parasites and the spread of the disease were encountered practically everywhere: the country is tropical, and the vast majority of its inhabitants go barefoot, live away from sewerage, and work in the soil.

Severity of Infection in Madras Presidency. Although the investigations indicated that nearly everyone in the Presidency was infected, all classes and all walks of life were not infected to the same degree. Sweepers, or town scavengers, and ryots working in close contact with the soil were found to harbor six times as many worms as the police, and

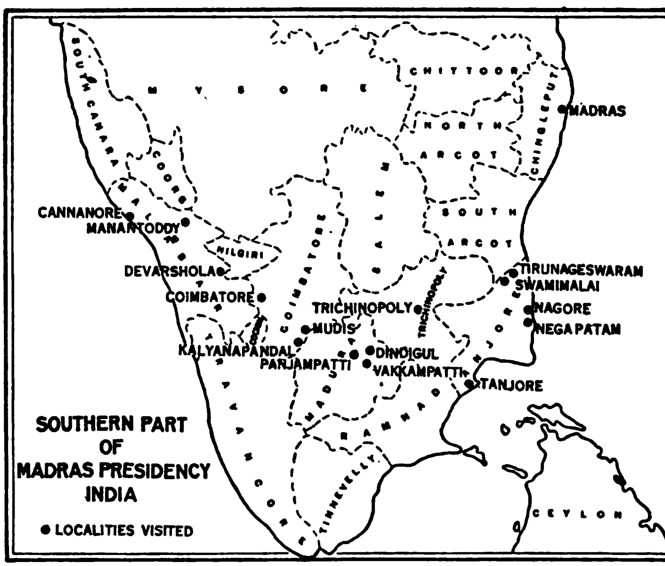


Fig. 40.—Localities visited in investigation into the incidence and effects of hookworm disease in Madras Presidency, India

twelve times as many as the classes who spend most of their time indoors. Among most classes the infection seldom produces severe symptoms, as the parasites are relatively few in number and nearly always the less harmful Necators. It is chiefly to estate laborers that the infection brings an appreciable diminution in health and energy. Since, however, the laboring classes, which are most severely infected, make up the bulk of the population, the country must suffer in the aggregate an enormous economic loss from the effects of the disease.

The following paragraphs give a brief résumé of the findings in the different localities investigated:

a. Inquiry at Negapatam. Of the total of 8,969 persons examined in the investigations conducted at Negapatam, 98.6 per cent of the coolies in the emigration depot were found infected and 91.0 per cent of the people in the town. Since the coolies examined were drawn from thirteen districts and four states of the Madras Presidency, and since the infection was found as often among those who had never before left the country as among those who were emigrating for the second or third time, the results demonstrated hookworm disease to be endemic in India. They suggested also that the infection was universally prevalent in rural areas of the Trichinopoly, Tanjore, Malabar, Madura, and South Arcot districts (see map, Fig. 40, page 162).

The infection occurred in all classes of people examined, irrespective of locality, caste, age, sex, or occupation, yet it was noted that ova were found more readily in specimens from the depot and village population than in those from residents of the town. Sixty-two per cent of the coolies examined at the depot, practically all of whom harbored hookworms but who nevertheless constituted a selected group, were in apparent good health and an additional 35 per cent in fair health. Not more than 3 per cent were visibly affected. Among the children of the town, however, the presence of hookworm infection was unquestionably responsible for much ill health, anemia, and retardation of physical development.

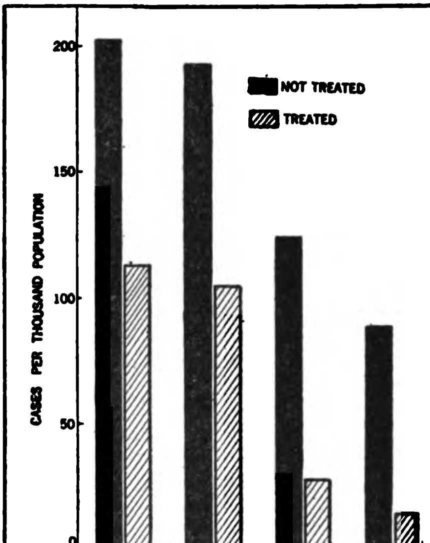
b. Swamimalai-Tirunageswaram. These two typical villages in the Tanjore district were selected for investigation in the hope of gaining some insight into the incidence of the infection among the village population of India. All of the 239 persons examined in the two towns were found infected, irrespective of sex, age, or apparent state of health. The physical condition of the coolie population as a whole was poorer than that at Negapatam. Again the school children showed marked debility and general retardation.

c. Dindigul. Dindigul town and the few neighboring villages were next chosen for observation. Of 412 persons microscopically examined, including sweepers, police constables, factory hands, school children, and patients in hospital, 100 per cent were found infected. Seventy-nine sweepers harbored an average of 127 worms per case; fifty-two police, an average of twenty-one; twenty-one persons of the upper and middle classes, an average of eleven. On the whole the infection was light; in the main the worms were of the species Necator.

d. Vakkampatti-Panjampatti. Examination of 250 fecal specimens in these two villages, located five miles from Dindigul, again showed 100 per cent infection of a degree that, though still mild, was decidedly heavier than in the town.

e. Trichinopoly jail. Of convicts who had resided in the southern part of Madras Presidency, ninety-seven of every 100 examined were found infected. The severity of the infection varied widely according to districts, the average number of worms harbored ranging from 6.2 to 102.8. For ten selected districts the average complement of worms harbored was sixty-two. Here again the worms were mainly of the species Necator.

No clear relationship was discovered between the hemoglobin index and the number of hookworms harbored, and no justification for classification into light, mild, and severe cases on the basis of degree of anemia. Treatment which resulted in complete elimination of the parasites raised the hemoglobin index only two-tenths of a point, or from an average of 74.6 to 74.8. It was, however, shown fairly conclusively that freedom from hookworm disease diminished the susceptibility to bowel complaints and influenza, shortened the period of illness from these diseases, and lowered the death rate (see Fig. 41). There was, moreover, in the matter of gain in weight, a slight difference in favor of treated cases, 72.2 per cent of them showing a gain as compared with 66.3 per cent of untreated cases.



YEAR	1918		1919		1920		1921	
AVERAGE POPULATION	550	553	724	654	522	682	452	935
TOTAL CASES	112	64	140	69	65	19	40	13
TOTAL DEATHS	10	5	8	0	1	0	0	0
AVERAGE DURATION OF ILLNESS DAYS	14.1	15.6	15.1	10.7	14.2	9.2	14.8	9.4

Fig. 41.—Incidence of bowel complaints, Trichinopoly jail, India, 1918 to 1921, inclusive. Among prisoners who had *not* been treated for hookworm disease, sickness and deaths from bowel complaints were much more frequent than among those who had been treated

Study of the records for 1,878 prisoners brought out the interesting fact that while the *incidence* of hookworm infection is not appreciably affected by jail life even under sanitary conditions, a natural progressive elimination of worms takes place that does very markedly affect the *intensity* of the disease. Thus, an average infection of fifty-eight worms on admission fell to forty-eight among inmates of a month and to thirty-two, twenty-nine, and seventeen worms, respectively, among inmates of three, twelve, and eighteen months. After eighteen months the average number of hookworms per case, though low, remained nevertheless fairly constant, even so long a stay as seventeen years failing to bring elimination of all the worms.

f. Coimbatore jail. During an interval in the work in Trichinopoly jail brought about by an epidemic of cholera, the stools of 463 prisoners in the Coimbatore jail were examined for hookworm ova and the hemoglobin indices determined in 300 cases. The rate of hookworm infection was 87.5 per cent; the average hemoglobin index, 72.4. The few figures collected showed again that a prolonged stay under the sanitary regimen of jail life brought down the intensity of hookworm infection but in no case eliminated it. There was no opportunity, however, as at Trichinopoly, for investigating the effect of treatment in improving the physical condition of the convicts.

g. Cannanore jail. Microscopic examination of the 964 inmates of Cannanore jail, drawn mostly from the wet districts of Malabar and South Canara, revealed a rate of infection of 89.7 per cent. The incidence among new arrivals is probably nearer 99 per cent, for examination of 197 specimens obtained from persons lately admitted to the jail showed ova in 196, or 99.5 per cent. Only a few cases presented clinical manifestations of severe or even moderately severe hookworm infection. The large number of infected convicts were freed of their worms in a short time by a small staff administering systematic treatment.

h. Manantoddy-Devarshola. On these estates examination of about 2,300 coolies gathered from diverse parts of the Presidency showed 100 per cent hookworm infection among coolies from wet districts and 83 per cent among those from dry. Hemoglobin estimations made on 200 of the coolies revealed an index of 60.0. Most of these estate coolies were in pitiful physical condition.

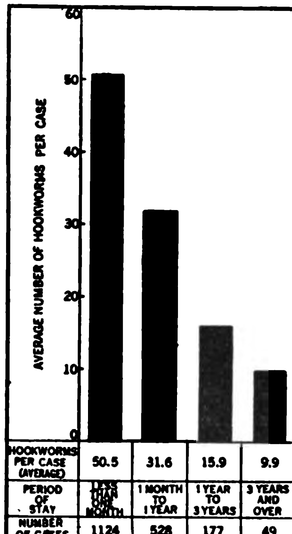


Fig. 42.—Worms harbored by 1,878 prisoners examined in Trichinopoly jail, India, grouped according to length of stay in jail. Natural progressive elimination of worms takes place as the period of jail residence lengthens, the opportunities for acquiring additional heavy infection being limited

i. City of Madras. Among 1,782 persons examined at the Carnatic mills in the city of Madras, the general rate of infection was 64.5 per cent. Among clerical workers it was only 18.4 per cent. Of 609 persons examined at the joint school of the Buckingham and Carnatic Mills, the teachers, who wear shoes, were 15.8 per cent infected, and the pupils, who go barefoot, 55.7. In the Chingleput town reformatory 88.6 per cent of the 245 persons examined were found infected.

Signs of severe hookworm disease were seldom seen at the mills; only seventeen cases of profound anemia were observed, and these improved rapidly under treatment. Sanitary latrines, provided in sufficient numbers and in convenient places at the mills, are unquestionably a factor in keeping down the infection. Elsewhere in the city of Madras gross soil pollution occurs, especially around the huts and tenements. In a section of the city containing several hundred one-room tenements, inspection disclosed only one latrine.

j. Mudis tea estates. On this group of five tea estates, located seventy miles south of Coimbatore, microscopic examination of 794 coolies, for the most part recruited from the plains of Madras Presidency, revealed 91.6 per cent infected; examination by treatment and recovery of worms revealed 100 per cent infected. The number of worms harbored by seventy-four coolies whose worms were saved after treatment ranged by provinces from 21.5 to 205.7 per person, an average of 92.9 (see Fig. 45, page 170). Hemoglobin estimates on 1,558 coolies revealed an average index of 74.8, with 10 per cent of the cases lower than 50. Here again no correlation was found between the hemoglobin index and the number of hookworms harbored.

INCIDENCE IN AUSTRALIAN TERRITORY

By the end of the year 1921 all of the projects contemplated in the original plan for the control of hookworm disease in Australia, embracing surveys or control operations in every Australian state and in the three territories, were under way. Surveys were completed during 1920 or 1921 in Tasmania, in New South Wales, in Victoria, in the British Solomon Islands adjacent to Papua, and in additional areas in the state of Queensland. Results to date indicate that Western Australia as well as an area in Northern Territory centering in Darwin is entirely free of hookworm infection.

Victoria and Tasmania. In the survey of the state of Victoria no hookworms were found among the 1,629 persons examined. The mines were as free of infection as the surface, where climatic conditions, particularly lack of rain, are unfavorable to the development of larvae. In Tasmania 2,209 fecal examinations revealed only two cases of hookworm infection, both in persons who had arrived from Fiji during the preceding seven months. The general climatic conditions of this state also are considered unfavorable to the development of hookworm larvae.

State of Queensland. During the year 1921 surveys were completed in nine areas, including the Cloncurry-Hughenden, Longreach-Emerald, and Charleville-Dalby districts, which cover about 500,000 square miles and embrace most of the interior of Queensland.

Examination of 2,120 persons in the **Cloncurry-Hughenden** area showed only fourteen, or 0.66 per cent, infected, and all of these fourteen had received their infection in other regions. The conditions here with respect to rainfall are particularly unfavorable for the development and

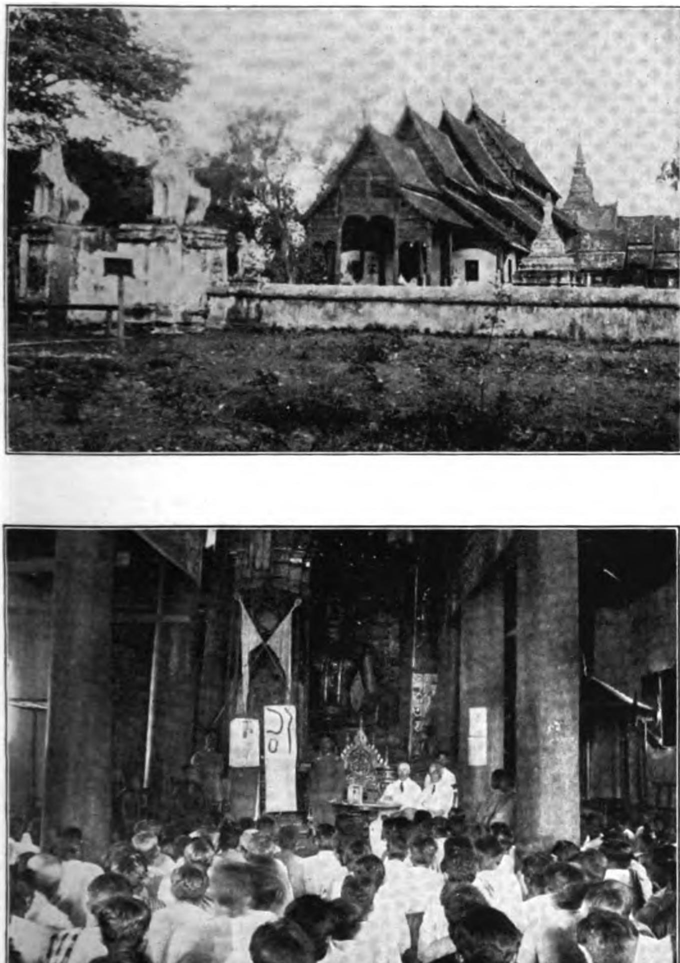


Fig. 43.—Ancient temples in Siam put at service of hookworm commission as headquarters for meetings and distribution of literature. Educational activities are an essential feature of the world-wide crusade against hookworm disease

Fig. 44.—Groups of natives assembled for treatment, Tupile, Panama. Hookworm campaigns afford an excellent means of instructing primitive peoples in the rudiments of sanitation

spread of the disease. In fact, the whole area would seem to be definitely non-infectible.

In the **Longreach-Emerald** area examination of 759 children at selected state schools revealed nine cases of hookworm disease, or a percentage of 1.2. The low rainfall, producing dry soil conditions which interfere with the development of the larvae, and the large tracts of land held for pasture, with only an insignificant acreage under cultivation, are believed to be responsible for the low incidence. The survey demonstrated that the disease is almost certainly absent from the surface; the coal mines near Clermont, however, were not investigated.

In the **Charleville-Dalby** area 535 school children were examined and none were found infected. Here again low rainfall was chiefly responsible for the absence of indigenous hookworm disease.

Investigations were also carried out in a small area of fifty-nine square miles centering in the city of Rockhampton, Queensland. In this survey 4,931 persons were examined and only 1.03 per cent found to be infected—a rate too low to call for control operations. The low incidence in the Rockhampton district is explained by the fact that the city has an effective system of night soil disposal, while the district as a whole has little rainfall and but a small proportion of its total area under cultivation. The natives of Hammond Island, near Thursday Island, were examined and found, owing to their habit of living on the beach, to be entirely free of hookworm infection. In an area including Brisbane and vicinity the rate of infection recorded was only 1.4 per cent, and worm counts revealed the average severity also to be low. Only one small region in the state of Queensland remains to be visited by the survey staff—an area with a small population located at the southern end of the gulf of Carpentaria.

Papua. The territory of Papua, surveyed in 1917 by Dr. J. H. Waite, was again surveyed in 1920 by Dr. S. M. Lambert. The investigation, covering the seven months from May 14 to December 15, disclosed a high rate of hookworm infection as far as the survey staff was able to penetrate the country.

The total population of the 821 villages under government control is estimated at 50,000 and in addition there are 7,000 indentured laborers in the colony. The entire population, with the exception of a few whites, consists of native Papuans. The staff examined 6,141 indentured and 633 casual laborers on sixty plantations; 10,372 natives in 166 villages; and 759 natives in nine mission schools. On the plantations the rate of infection was 65.8; in the villages, 54.9; at the mission schools, 59.7. Among the ninety-two white residents examined, only 17 per cent infection was recorded.

There was little difference in the rate or the severity of infection between the villages and the plantations: the average village rate of infection was only 11 points lower than the average plantation rate. Grouped geographically the plantation rates ranged from 62.2 to 84.5 per cent, being highest in the Delta division, where rainfall and temperature are high and there is gross soil pollution. The village rates ranged

from 33.5 to 79.7 per cent. Marked contrast existed between the infection rates of villages in the dry and wet regions, the average being 13.1 for the dry and 70.9 for the wet.

Hemoglobin estimates on 2,891 infected and 835 non-infected natives showed the average index of the infected group to be 55.7 as compared with 63.5 for the non-infected. The low hemoglobin index of the non-infected group is believed to be due in the main to malaria, a disease with which practically all Papuans are infected. Clinical hookworm disease existed in only 5 to 10 per cent of the natives examined. Estate managers report that marked benefits in health and strength have resulted from the course of treatment administered as a feature of the survey.

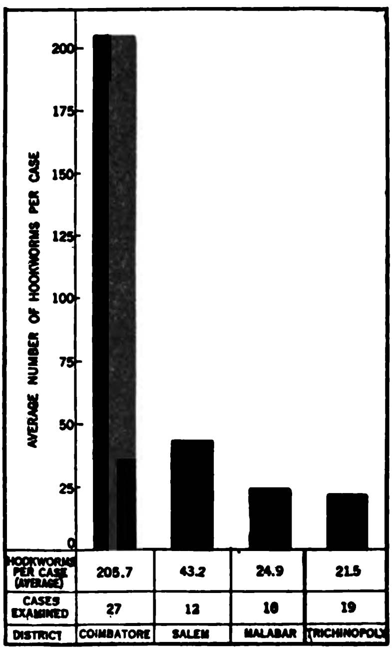


Fig. 45.—Average number of worms harbored by seventy-four coolies at work on the Mudis tea estates, Madras Presidency, India, grouped according to the coolies' districts of origin. Those from Coimbatore were almost entirely of the uncleanly Panchama class

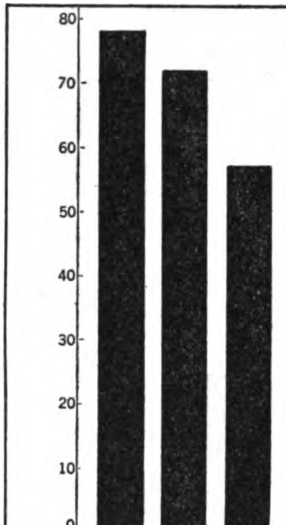
INVESTIGATION IN CHANGWAT LAMPANG, SIAM

Under the new plan of organization adopted for Siam, survey units, operating from strategic centers, are starting out to cover the country in an effort to ascertain the prevalence and severity of hookworm infection and to assist the local authorities in developing among the people a sanitary sense. One such survey—that in the changwat Lampang, mondhol Maharat—was in progress from June 7 to September 9, 1921. Estimates based on the results of the survey indicate that approximately 200,000 of the 275,000 people living in the changwat harbor hookworms.

Examination of 4,038 persons revealed an infection rate of 75.0 per cent; in the four aumphurs in which examinations were made, the rates were 74, 71, 70, and 85 per cent. Among the general population the infection rate was 74.9; among school children 71.7; among

prisoners 73.9; among gendarmes 78.3; and among soldiers 78.2 per cent.

The infection was of a moderate degree of severity. From 355 cases whose stools were saved for seven hours after treatment, a total of 8,181 hookworms were obtained, or an average of twenty-three worms per case. The largest number of worms expelled by any one person was 251. Hemoglobin determinations made on 503 school children gave, it is true, a low average index—74.5—but this was due to various contributing causes, including, in addition to hookworm, malaria and malnutrition.



PATIENTS (DAILY AVERAGE)	78	72	57
YEAR	1918-1919	1920	1921

Fig. 46.—Average daily number of patients in Lionel Town hospital, Vere area, Jamaica, 1918–1921, inclusive. Following the anti-hookworm campaign in this area in 1920 there was a significant reduction in hospital cases

CONTROL EFFORT IN BRITISH HONDURAS

An infection survey carried out in British Honduras from February 7 to May 24, 1916, under the direction of Dr. L. W. Hackett, who was lent for the purpose by the Board, awakened considerable interest among the people, and on September 15, 1917, systematic examination and treatment were begun. Through courtesy of Government the Board has received a copy of the report of the campaign, prepared by Thomas Gann, the medical officer in charge, showing results accomplished up to May, 1921.

Approximately 15,000 of the colony's total population of 40,458 live in localities where the infection is so low as not to necessitate treatment. Of the remaining population, practically four-fifths have been reached by the treatment staff. Resurveys made during 1920 of districts whose inhabitants were treated two or more years previously, show substantial reduction in the incidence of infection.

The excellent results accomplished toward stamping out the disease are due in no small degree to the stress that has been laid on soil sanitation. From the beginning police and health authorities have insisted upon the provision of suitable latrine accommodation, until it may be said that at present nearly every place in the colony is provided with adequate sanitary latrines. The exceptions are certain remote

Carib and Indian villages, some small settlements of a few houses each, and lumber and other camps composed, usually, of only temporary habitations.

SURVEYS IN MISCELLANEOUS AREAS

Upon resumption of the campaign in **Dutch Guiana,** investigation in the area selected for initial control operations showed 92.2 per cent infection. A complement of from 300 to 400 worms was not unusual; two persons after a single treatment expelled more than 1,300 worms. From the republic of **Colombia** high rates of infection continue to be reported, the average for the areas embraced within the control program of the year being 92 per cent. In Quebradillas, the first area to be worked under the new plan of control approved for **Porto Rico,** an infection rate of 86.2 per cent was recorded among the 7,107 persons examined. Many severe cases were noted, though worm counts and hemoglobin estimations do not reveal a very severe general infection. In **Jamaica** an average infection rate of 39 per cent is reported for the districts worked during the years 1920 and 1921. In this colony a striking difference is reported in the infection rates for wet and dry districts, the average being 85 per cent for the former and only 10 per cent for the latter. The infection rate for the British Solomon Islands, just surveyed, is reported as 24.7.

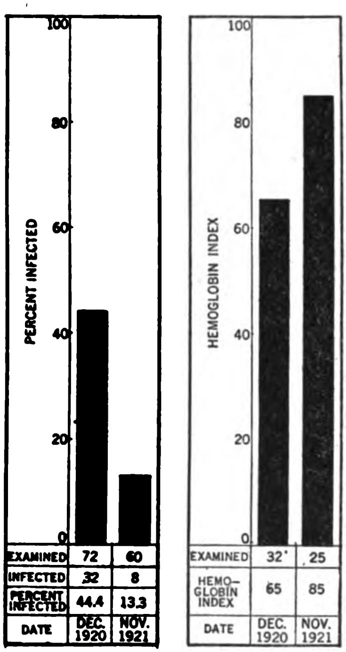


Fig. 47.—Effect of hookworm treatment administered in the Rio Cobre Home, Jamaica. The incidence of hookworm infection among the inmates was reduced and the hemoglobin index raised

BENEFITS OF HOOKWORM TREATMENT

Improvement in Health and Physical Condition, Jamaica

Statistics for the Lionel Town hospital in Jamaica, an institution which serves the estates and villages of the Vere area, where operations for the control of hookworm disease were carried out between November,

1919, and April, 1920, show that during 1918 and 1919 the average daily number of patients was seventy-eight, and during 1920, seventy-two. In 1921, following a campaign against hookworm disease in the area, it dropped to fifty-seven—a decrease in one year of 20.8 per cent (see Fig. 46, page 171). Before 1920 more than 80 per cent of the patients admitted to the hospital were infected with hookworm disease, as compared with not more than 5 per cent during 1921.

At another institution in Jamaica, the Rio Cobre Home, thirty-two children out of the seventy-two examined in December, 1920, had hookworm disease; in November, 1921, following a campaign against the disease in which all infected children received treatment, only eleven out of sixty examined were found to be infected. Meanwhile the average hemoglobin of all children in the institution had risen from 65 to 85, an increase of 30.8 per cent (see Fig. 47, page 172), and the average weight had increased from 46.5 to 51.6 pounds, or 11.0 per cent. Twenty-five of the children examined in 1921 were among the group of thirty-two who were cured of hookworm disease a year before, and eight of them were found to have been re-infected—a re-infection rate of 32 per cent.

Fig. 48.—Hemoglobin indices of 18,514 persons in Costa Rica. Compare index of the group not infected with hookworm disease with that of the infected persons before treatment as well as after cure. In this country increased appetite, blood regeneration, and improved health promptly followed treatment for hookworm disease

Increased Efficiency of Sumatran Laborers

Recent official government correspondence from Mauritius calls attention to the fact that by means of control measures in Sumatra during the period from 1906 to 1918 the proportion of first-class coolies (those not infected, or only lightly infected, with hookworms) rose from 35 to 90 per cent, while that of moderately infected coolies fell from 50 to 10 and that of severely infected from 15 to 0.5 per cent. The number of badly infected coolies on insanitary estates in this colony averaged ten; on sanitary estates, three. The sanitary estates showed 1.8 per cent of coolies sick; the insanitary, 3 per cent.

Three estates in Sumatra which, in spite of all recommendations,

refused to adopt hookworm control measures, had in the course of two and one half years 4,657 admissions to hospital. Three other estates with a laboring force of the same size which did adopt these measures had only 1,034 admissions—a difference of 78 per cent. One hospital admission represented on the average twenty-two days of treatment, which, reckoned at fifty cents a day, meant an aggregate loss of no less than 40,000 guilders during a period of only two and one half years.

II

LIFE OF HOOKWORM EGGS AND LARVAE IN THE SOIL

The department of medical zoology of the School of Hygiene and Public Health of the Johns Hopkins University dispatched to the island of Trinidad, British West Indies, during the summer of 1921, an expedition to study the life of hookworm eggs and larvae in the soil. The expedition was under the direction of Dr. William W. Cort of Johns Hopkins University and was aided by a subvention from the Board. Those who took part in the investigation included Dr. James E. Ackert of the Kansas State Agricultural College, Mr. Donald L. Augustine of Johns Hopkins University, Dr. George C. Payne, the Board's director in Trinidad, and his wife, Dr. Florence King Payne. The party from the United States sailed from New York May 5 and returned September 17. The work was conducted with the active co-operation of the Government ancylostomiasis commission and was carried out at Princes Town, in the south central part of the island in an area where sugar-cane cultivation predominates and over 70 per cent of the people are hookworm infected.

Finding of Unsheathed Hookworm Larvae in the Soil. Although various investigators have reported that under certain conditions mature hookworm larvae may lose their sheaths while still living in the soil, the general opinion has prevailed that they normally pass this period of their existence enclosed in sheaths and complete their second larval molt only when penetrating the human skin. Both field and laboratory studies in Trinidad showed, however, that it is a common occurrence for mature hookworm larvae to lose their sheaths while continuing to live in the soil. The loss of sheath, moreover, did not render the larvae non-infective.

Of a total of 4,265 mature larvae isolated from a series of 108 positive soil samples taken from an area of a sugar-cane field heavily polluted by individuals infected with hookworms, only 42 per cent were enclosed within the protective sheath. The finding was further supported by the studies of conditions under which hookworm eggs hatch and develop and of the migration of infective larvae, both of which showed that a proportion of the larvae became unsheathed while in the soil. The discovery will doubtless call for a revision of many former ideas that have resulted from a study of sheathed forms.

Length of Life of Larvae in the Soil. The discovery that so large a proportion of the larvae shed their skins while still living in the soil introduces a new factor for consideration in determining the length of larval life. Under favorable conditions this molting was not found to shorten the life of the larvae, although in unfavorable environments it

did seem to decrease somewhat their chances of survival. Tropical temperature and other environmental conditions which tend to increase the activity of the mature hookworm larvae were found to shorten their lives through the more rapid using-up of the stored food material.

The Trinidad investigations showed that the life of larvae in the soil seldom exceeds six or seven weeks. Heretofore it had been believed that under favorable conditions of temperature and moisture they lived for months or even years. In the cane-field area, where there was intense soil infestation, the number of larvae was reduced more than 90 per cent within three weeks after soil pollution was stopped, only a very few larvae being left at the end of six weeks. Laboratory experiments with different soils under different conditions showed, too, a great reduction in the number of larvae in two or three weeks and an almost complete dying out in six weeks.

Relation of Chickens to Spread of Hookworm Disease. So far as Trinidad at least is concerned the expedition reported that chickens help to limit rather than to spread the disease. The great majority of hookworm eggs ingested by chickens failed to produce infective hookworm larvae after passing through the chickens' alimentary tracts, the failure being attributed in part to the breaking of eggs in the gizzards, to injury from urine in the chicken feces, and to malnutrition of the larvae. Although chickens that have swallowed hookworm eggs day after day may establish dangerous infective spots around drinking receptacles; although they may carry eggs and larvae from places unfavorable for their development and deposit them in favorable environments; and although they may transport to dooryards and other places traversed by barefooted persons human stools voided in out-of-the-way localities, the reduction of mature hookworm larvae brought about by the fowls was nevertheless found to be more than sufficient to offset the establishment of these additional infective spots.

Relation of Pigs to Spread of Hookworm Disease. The discovery of a new species of hookworm (*Necator suillus*) as being of common occurrence in the domestic pigs of Trinidad marked the study of the rôle played by pigs in disseminating the infection. The investigation showed, moreover, that the pig, ranging freely, is an important factor in the spread of hookworm infection. A high percentage of human hookworm eggs ingested by pigs were found to produce infective larvae, the hatching, during the rainy season in Trinidad, usually occurring within five days.

Effect of Hookworm Control Measures. To determine the sources of human infection and to learn the effect of a control campaign on soil pollution, on soil infestation, and on human infection, an intensive epidemiologic study was made of an area in a sugar estate. Of 146 East Indians and negroes living in the area chosen for study, 117, or 82.4 per cent, were found to be infected with hookworms. A series of three treatments greatly decreased the proportion of persons infected as well as the total number of worms harbored.

Fig. 49.—Group assembled to hear lecture and receive treatment for hookworm disease, Fusagasugá, Colombia

Fig. 50.—Exhibit on hookworm disease at the National Agricultural Exposition, Brisbane, Australia

Fig. 51.—Negro family, residents of Federal District, Brazil. All except mother treated in 1919 for hookworm disease. Mother first treated in 1921, expelled 123 hookworms; other members of family, re-treated in 1921, expelled average of six worms

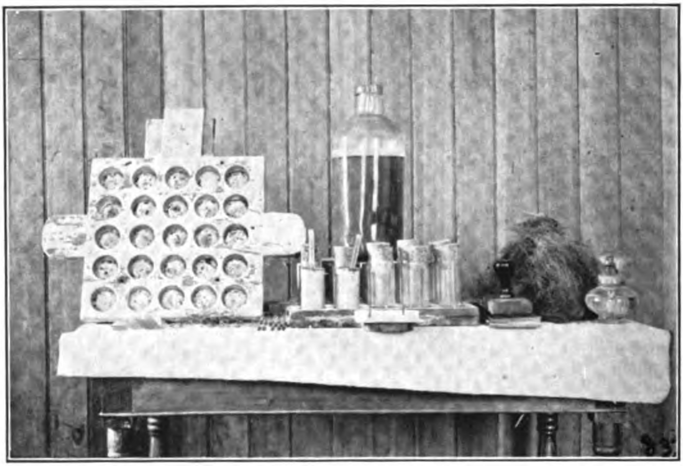


Fig. 52.—Examining board and other apparatus used in Jamaica in examining fecal specimens by the salt-flotation process. Great speed, accuracy, and economy are resulting from this and other improved methods of diagnosis

First inspection showed soil pollution in the area to be widespread and gross, though concentrated at certain easily accessible places in the cane fields near the barracks. Soil samples showed little soil infestation except along the heavily polluted strip of cane. The building of adequate latrines and the carrying on of an educational campaign effected great reduction in pollution in the cane field. A series of soil samples taken at intervals showed a rapid dying out of infective hookworm larvae, so that in about six weeks soil infestation was practically eliminated.

Examination of soil samples indicated that even if moisture was present, conditions on the clay loam soil were not favorable for the development of hookworm larvae unless there was considerable protection, especially by vegetation; and an analysis of the habits of the people in relation to the distribution of soil infestation suggested that most of the heavy infection was due to the practice of defecating at selected places in the cane field. The localized character of soil infestation, especially in the cane field, showed that there was little migration of infective larvae, although there was evidence that the larvae could be carried considerable distances by water.

Epidemiologic Study on Cacao Estate. Examination of the people living in three houses on a cacao estate showed a heavy infection with hookworms. As in the case of the sugar estate, pollution of the soil was confined almost entirely to definite spots, "natural latrines," in the cacao grove near the barracks. Here, again, examination of soil samples demonstrated that the larvae did not migrate and that almost all the human infection was derived from visits to the natural latrines. Even in this grossly polluted strip of soil, however, the findings were somewhat irregular, indicating that conditions were not always favorable for the larvae to develop. Six weeks after three routine treatments had been given, soil samples taken from the former heavily polluted spots showed marked reduction of soil infestation.

Migration of Larvae in Soil. Studies of migration showed definitely that hookworm larvae do not move from their original place of development unless carried away by the action of water or on the feet of man or one of the domestic fowls or animals. Larvae placed on moist soils did not migrate in periods of from fifteen hours to forty-two days. Not only did they not migrate even when their environment became unfavorable, but in the course of the experiment there was, through the dying out of the larvae, striking reduction in their numbers, the rate of reduction increasing with the passage of days.

Position of Larvae in the Soil. Infective hookworm larvae under the most favorable conditions of moisture and temperature were found to remain on or near the surface of the soil. They crept up pieces of wood, decaying vegetation, and other objects only as far as a film of moisture extended. They were not found within drops of water collected in the axils of leaves or green plants, nor upon the leaves themselves. At the centers of soil infestation they were found on the leaves or twigs

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when the latter were moist. When the leaves or twigs were dry, the larvae retreated to the underlying soil.

GREATER SPEED AND ECONOMY IN FIELD OPERATIONS

The demonstration by Cort and his associates that the life of hookworm larvae in the soil is much shorter than had been commonly supposed; that the larvae do not migrate; and the earlier demonstration by Smillie that hookworms are slowly acquired and slowly lost, find complete confirmation in the results of the 1921 resurveys of Governor's Island and Jacarepagua, Brazil (see pages 127 to 129). Not only do these findings abundantly confirm the fundamental soundness of the working methods that have been employed to effect the control of hookworm disease, but they indicate the lines to be pursued in future efforts to secure greater speed, economy, and efficiency in field operations. With the data now at hand it is possible to formulate a simplified plan of procedure based, not on removing the last hookworm from every infected individual, but on keeping reduced to a point at which they do no serious harm to the individual or to the community, the number of worms harbored. A paper recently published by Dr. Smillie gives the details of a method he has evolved to meet this end.[1]

Plan of Control for Heavily Infected Areas. In communities where almost all the people are soil workers—poor, ignorant, barefoot, spending ten or twelve hours daily in the fields, and subjected to all the factors that tend toward heavy infection—Dr. Smillie recommends a preliminary treatment campaign in which three treatments of a standard remedy would be given to all workers in the soil. Simultaneously the attempt would be made to secure the installation of latrines at not less than three fourths of the houses. After this proportion of the homes had sanitary latrines a second treatment campaign would follow. In the second campaign every positive case would receive only one treatment, and special effort would be made to treat all who work in the soil. Following this, a small staff would be stationed permanently in the community to secure the continued construction and maintenance of latrines, to treat newcomers, and to serve as the basis for a future rural health unit.

Plan for Lightly Infected Areas. In communities whose inhabitants generally are in better circumstances, accustomed to a better mode of living, and less severely infected, he recommends treating twice all positive cases except soil workers, whom he would treat three times, and at the same time inaugurating a campaign of latrine construction. Upon completion of treatment a small staff, who would remain to continue the work of latrine construction and to treat newcomers, would devote certain days of each week to general dispensary work, when they would treat any hookworm infected persons who came to the clinic. Here, again, the small unit would serve as the basis for extending perma-

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[1] The Results of Hookworm Disease Prophylaxis in Brazil, by Wilson G. Smillie. *The American Journal of Hygiene*, January, 1922, v. 2, No. 1, pp. 91–94. Same reprinted.

nent rural sanitary activities throughout the community. While hookworm infection would not be eradicated by either of these plans, hookworm disease would be adequately controlled if latrines were constructed and faithfully maintained and used.

Mass Treatment in Absence of Latrine Provision. In communities whose inhabitants suffer with severe hookworm disease and who either cannot or will not build and use latrines, treatment is the only method of attack that can be used. The Brazilian experience shows that an individual who receives two standard treatments and is thus freed of practically all his hookworms, but who reverts to the conditions of living which produced his first infection, does not usually regain a large complement of worms until at least three years have elapsed. Under such circumstances it is therefore safe to follow the plan of giving all individuals a standard treatment once a year.

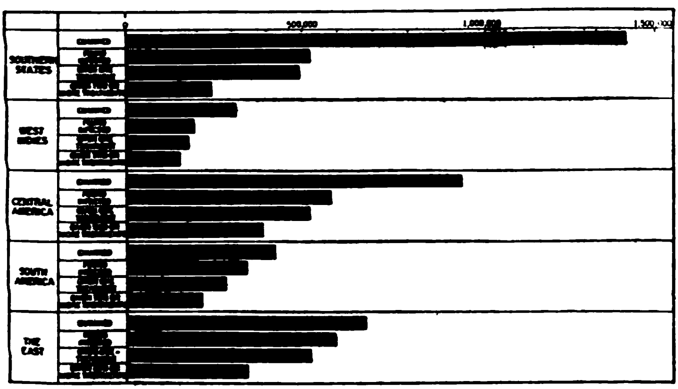


Fig. 53.—Number of persons examined and treated in world-wide campaign against hookworm disease, 1910–1921, inclusive, by main geographical divisions (for details, see Table 1, page 218.)

EFFECT OF SALT ON VIABILITY OF HOOKWORM EGGS AND LARVAE

A limited study of the effect of salt on the viability of hookworm eggs and larvae, carried out during 1921 by Dr. Fred C. Caldwell, director of hookworm control in Panama, showed that for all practical purposes sea water prevents the development of larvae. Particularly favorable conditions for the study were afforded by the habits of the San Blas Indians, who live on 227 islands stretched along 130 miles of coast and have the time-honored, inviolate custom of defecating in the sea. Non-Indian residents, however, frequently pollute the soil. In a number of localities

on three islands having the same climatic conditions, the average rate of infection among 595 Indians examined was only 4.7 per cent, as compared with the rate of 62.9 per cent among thirty-five non-Indian residents.

In the Spanish village of Puerto Obaldia on the San Blas coast, where soil pollution was general, every person examined was found infected. A large proportion of the non-Indian population of all three of the islands had lived for considerable periods in the city of Panama, a fact that is doubtless responsible for the rate of infection being lower among them than it would have been if they had spent their whole lives on the islands. All the infected Indians had either spent extended periods on the mainland or had lived in close association with Jamaicans or Colombians while engaged in the gathering of rubber.

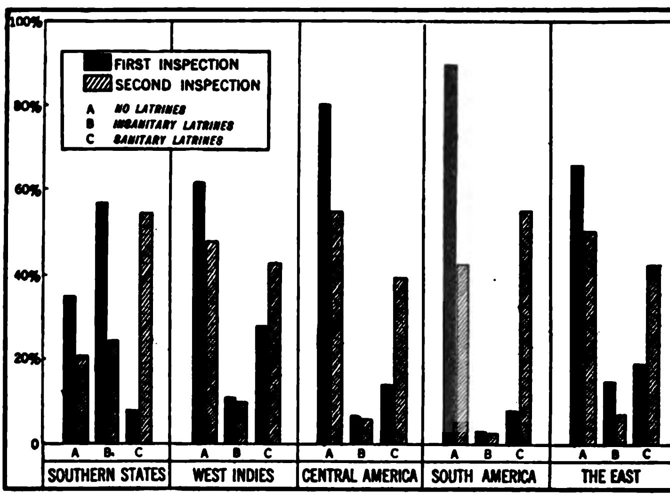


Fig. 54.—Sanitary conditions on first and last inspections compared for the five main geographical divisions of the world-wide campaign against hookworm disease, 1910–1921. In all regions extensive sanitary improvement has gone hand-in-hand with treatment

APPARATUS FOR RECOVERING HOOKWORM LARVAE FROM THE SOIL

The staff engaged in the investigations in Trinidad used with much success, in every phase of their work, a modification of the apparatus invented by Baermann for recovering larvae from the soil. It permitted determination to be made of the exact sources of infection through examination of large numbers of soil samples from various parts of areas in which hookworm disease was prevalent; it enabled the staff to follow

closely the reduction of soil infectivity that resulted from the elimination of soil pollution; and it made possible not only a careful study of the con ditions under which the eggs develop, but also of the extent of migration of the larvae, the rate of unsheathing, and the length of larval life in different kinds of soil.

The apparatus consists of a glass funnel almost filled with water and with the outlet closed by a clamped piece of rubber tubing. The soil sample is placed in a sieve so fitted into the funnel that the level of the water is above the lower surface of the soil, thus bringing the soil sample into contact with water of a considerably higher temperature than that of the soil. Under these conditions a large proportion of the nematodes pass from the sample into the water, where they can be collected and counted.

For examining soil samples of half a pint or more, large glass funnels eight inches in diameter, and specially prepared brass sieves seven inches in diameter, three inches deep, and with a one millimeter mesh, were used. To prevent small particles of soil sifting through into the funnels the sieves were lined with one or two thicknesses of cloth. It is possible to substitute for the sieve a piece of wire screen covered with cloth, of such a size that it can be fitted down into the funnel. The sieves have the advantage, however, of being more easily handled in changing samples of soil.

III

DIAGNOSIS OF HOOKWORM DISEASE

WILLIS SALT-FLOTATION TECHNIQUE

The Willis salt-flotation technique of stool examination found added favor in the work of the year. It is proving particularly valuable for detecting light infections usually missed by the less refined plain smear and centrifuge processes. In Salvador, for example, it increased by 10 to 15 per cent the number of specimens found positive with the aid of the centrifuge. In Ceylon 449 additional positives were found in a group of 1,569 specimens—an increase in efficiency of 28.6 per cent.

The process calls for adding to the feces a saturated solution of coarse table salt drop by drop until the container in which the specimen is received is filled to the brim. The mixture is thoroughly stirred and allowed to stand for a few minutes to permit the ova to rise. A clean polished slide is then placed on the container in contact with the surface of the fluid. In a short time the ova adhere to the slide, which is removed and examined with the microscope. The method is so simple, efficient, and economical that it is rapidly coming into use in all countries. Tests in Queensland showed that as compared with the brine flotation method the Willis technique had the advantage of being quicker; of requiring less apparatus, no steel wool and no wire loops being needed; of using less salt solution; and of permitting the discarding of the tins after use and so offering no possibility of ova being carried from one tin to another.

To facilitate examination by the Willis method Dr. Molloy, in Nicaragua, has improvised a special board which has proved effective in field work. The board—the end of a box in which gasoline is shipped—measures 13¾ by 9½ inches, and is covered on one side with a piece of tin to facilitate washing. To this board are nailed, in two rows, the tops of ten containers. The specimen containers are placed in these tops before the salt solution is added. The board is of a convenient size to handle and is easily cleaned.

LANE LEVITATION METHOD

Colonel Sir Clayton Lane, who has been at work for several years seeking to develop a technique of stool examination that will combine the utmost simplicity with the greatest refinement, recommends a levitation process and stresses the advisability of using chemicals to preserve the stools and so permit their examination under more favorable circumstances than are usually found in the field. The fact that levitation may be applied as successfully in preserved as in fresh stools, if certain disin-

fectants are used, offers the hope that it may prove practicable to effect further economy and efficiency by dissociating diagnosis, in time and place, from the other phases of hookworm work.

Dr. Lane finds that the process of levitation when properly carried out collects in a condition of full visibility an average of ten times as many eggs as can be secured by other methods of slide preparation. In Bengal, for instance, he added by levitation about 10 per cent to the infection figures obtained from strained and centrifuged films; and Dr. Mhaskar, testing the results of examination by searching the stools for hookworms after a vermifuge had been given, found that levitation had disclosed 7 per cent more positive cases than had been yielded by ordinary film examination. Dr. Lane is continuing his studies with the aid of a small subvention from the Board, and proposes to establish, by actual counts of eggs in fixed quantities of stool, what proportion of the eggs are lost and what proportion are collected in a condition of full, uncamouflaged visibility, in examinations by the plain smear, the centrifuge, the salt flotation, and the levitation techniques. In each case comparison will be made of the figures for stools treated and stools untreated by chemical preservatives.

ESTIMATING SEVERITY BY COUNTING EGGS IN FECES

Dr. W. G. Smillie conducted in Brazil during 1921 a test in which he sought to ascertain the possibility of estimating the severity of infection by counting the ova in the microscopic field. One hundred thirty-five cases harboring an average of thirty-two worms each, forty of which had been found negative with the microscope, were included in the test. The centrifuge method of examination was used, and the positive cases were classified into five groups in accordance with the number of ova found in the stools. The cases were later treated and all their worms expelled.

So far as general averages were concerned there was a definite relationship between the number of ova in the stools and the number of worms in the intestines, but in individual cases the clue afforded by a single examination of the stool was very unreliable. One individual having very abundant ova harbored only twenty-three hookworms; while others having so few ova that they were found only after long and careful search, harbored from 150 to 200 hookworms.

DIFFERENTIATION OF HOOKWORM AND STRONGYLOID LARVAE

In the routine examination of feces in field laboratories it is difficult to distinguish hookworm from Strongyloid larvae. Dr. Smillie has evolved a simple process for identifying the larvae, based on the marked differentiation that takes place as they mature. The technique results in many specimens being found to contain Strongyloides that are unrecognized by routine microscopic examination.

At the end of the day's work specimens containing the larvae to be identified are prepared in a Petri dish of standard size. In the center of the dish a circle from five to seven centimeters in diameter is drawn with a wax pencil or with cocoa butter. Within this circle are placed from one to two grams of feces and from one to two mils of water. The dishes are covered and allowed to stand at a temperature of from 75° to 90° Fahrenheit. The cultures may be observed on the following morning—fourteen hours after preparation,—and again on the second morning—forty hours after the culture was begun. The top is removed from the Petri dish and an ordinary hand lens is used in searching for larvae in the water surrounding the feces. During the interval of fourteen hours the larvae leave the feces for the surrounding water and swim freely about in large numbers.

The different habits and sizes of the two larvae render identification easy. The Strongyloides occur in two forms: the first as free living adult males and females, which usually appear near the margin of the feces and are of a size to be readily visible to the naked eye; and the second as filariform Strongyloid larvae found at the very periphery of the water, usually with their bodies at a right angle to the circle, and in active, even frantic, motion. Hookworm larvae differ from the free living Strongyloides in that they are many times smaller and are usually found at or near the fecal margins. They are sluggish in motion and thus offer a marked contrast to the active filariform Strongyloid larvae.

IV

MALARIA CONTROL

ANTI-MOSQUITO MEASURES: SOUTHERN STATES

Malaria control by anti-mosquito measures made marked progress in the Southern States during the year. Despite unfavorable financial and climatic conditions a total area of 225 square miles was controlled and a total population of 228,740 persons protected. Through joint co-operation between the town and county authorities, the state boards of health, the United States Public Health Service, and the International Health Board, new demonstrations were conducted in twenty-six towns in the states of Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Texas; and in thirty-five other towns in these states and in Virginia supervision was given to the maintenance of control established in previous years. A considerable number of towns also conducted control measures on their own initiative and without outside assistance, a number of transportation and industrial corporations interested themselves in anti-mosquito activities, and from the towns the work began to spread to rural communities.

Measures Employed. In the work of control, effort centers on the elimination of the breeding places of malaria mosquitoes. The measures employed consist of simple drainage, filling borrow pits and shallow pools, channeling streams, clearing the margins of streams and ponds, removing obstructions, letting in the sunlight, oiling, and enlisting the services of the top minnow (*Gambusia affinis*) to keep down breeding. It is necessary also to protect unscreened or unsatisfactorily screened wells and cisterns and to remove or cover old tin cans and similar artificial containers.

In all towns in which work is conducted preliminary surveys are made to determine whether effective malaria control can be secured at reasonable cost. Whenever possible the surveys are made late in the summer or in the autumn of the year preceding the beginning of control effort. The drainage operations are usually so planned as to be practically completed before the mosquito season opens.

The measures employed, while practically eliminating the malaria mosquito, do not guarantee freedom from the mosquito as a pest. A significant decrease in the numbers of all mosquitoes—Culex as well as Anopheles—results, but it is much more difficult and expensive to obtain freedom from all mosquitoes than from Anopheles alone. To obtain complete mosquito control careful inspection of backyards and surrounding premises is required.

Results and Costs.[1] Figures 21 and 22 (pages 113 and 114) exhibit typical results accomplished. The reduction in malaria on the basis of

[1] All cost figures given in this paragraph exclude the expense of general supervision.

physicians' calls is in the case of some towns as high as 90 per cent. Figures showing the reduction effected are not available for all towns, however, as information concerning malaria incidence is seldom recorded for the years that precede the control program.

Several towns reported that the control operations resulted in malaria being completely eliminated. Physicians were practically unanimous in reporting a marked reduction in the number of their visits for malaria, and pharmacists stated that there had been a noticeable diminution in the demand for chill tonics and similar proprietary "remedies" for malaria.

In the new towns the cost of original installation during 1921 ranged from $225 for the town with the lowest cost to $6,234 for that with the highest, the total for the twenty-six amounting to $67,411. Inasmuch as a total population of 67,063 was protected, distributed in towns varying in size from 268 to 13,088, the cost per capita was $1.01. In the other thirty-five towns the maintenance measures protected a total population of 161,677 at an average cost per capita of only twenty-five cents.

Data submitted by thirteen of the twenty-six installation towns indicate that the average first year's cost of each main feature of the work was as follows: ditching $345 per mile, clearing streams $95 per mile, and oiling $3 per mile. The average cost of maintenance was $16 per mile. Premises were inspected for mosquito breeding at an average cost of six cents. All of these costs, of course, are subject to wide variation depending upon conditions to be met. Nevertheless, it is felt that the averages are fairly representative. In some towns natural conditions made possible control at trifling cost. Thus, in Bullard, Texas, control was secured for only $66.83, of which $11.83 was spent for oil and $55 for the labor of applying it.

The effectiveness of the control program is well illustrated by statistics for the town of Lake Charles, Louisiana. This town, with its population of 13,088, was embraced within the extra-cantonment zone in which anti-mosquito measures were carried out by Government during 1917. For that year the estimated calls for malaria numbered 250. The next year, following the installation of control measures, the calls dropped to eight. Upon the close of the war control effort in the town and vicinity was permitted to lapse, with the result that the cases of malaria rose to 500 for the year 1920. In 1921, following the renewal of control effort in April of that year, the total number of cases was only fifty.

Economic Value of Work. Complete data are not available to show the economic loss that results from malaria, and estimates are in most cases difficult to make. Nevertheless, certain facts and figures collected during 1921 are at hand to indicate the saving in dollars and cents effected by the application of control measures.

Thus, the town of Lake Charles, Louisiana, sustained during the year 1920 losses from malaria estimated at $26,000. During 1921 control measures, which practically stamped out malaria and eliminated this loss, were applied at a cost of only $4,965, representing a saving to the town in its malaria bill of $21,035, or 81 per cent. Again, Mr. George L. Grogan,

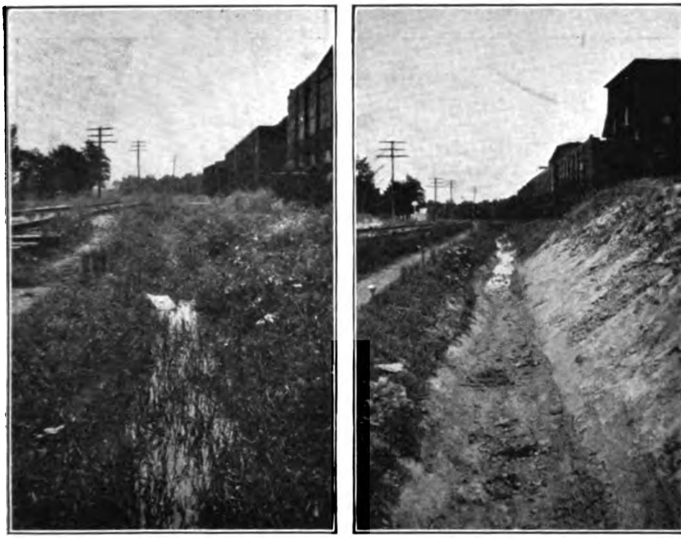


Fig. 55.—Ditch along railroad embankment, before and after draining, Demopolis, Alabama. Minor drainage operations constitute the chief feature of anti-mosquito measures as conducted in the Southern States

Fig. 56.—"V"-shaped ditch, a part of the drainage system installed to control malaria in and near La Puebla-Rivas, Nicaragua

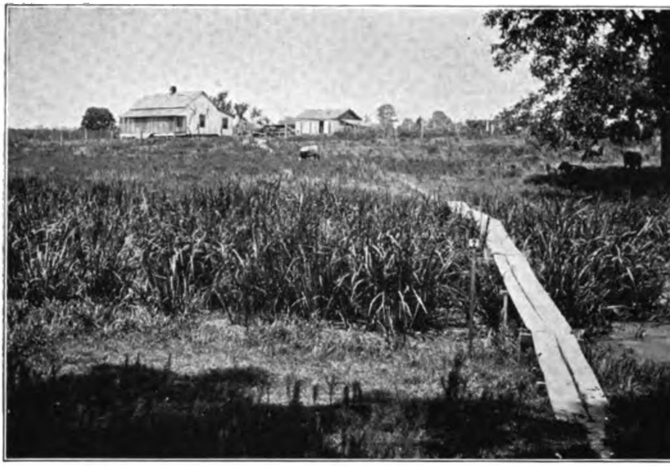


Fig. 57.—Anti-malaria, impounding water experiment at Mound, Louisiana. View across bayou, 700 yards above dam site, before clearing

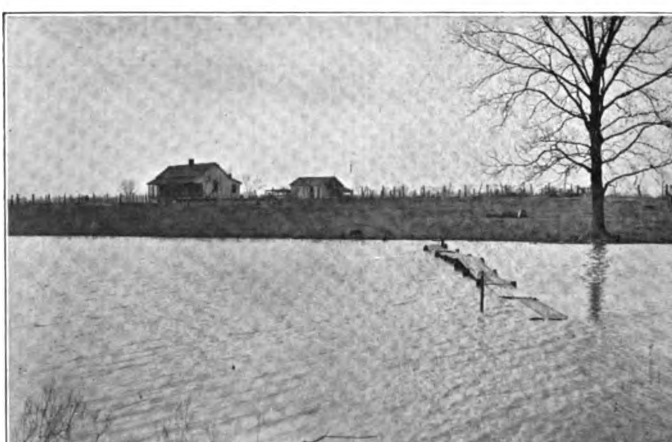


Fig. 58.—Same as Fig. 57, showing bayou filled with water

manager of the Grogan Lumber Company at Gladstell, Texas, states that the installation of control measures during 1921 cost the town a total of $5,036 and protected 500 people. In this instance the first year of control cut the company's malaria bill in half.

Public Appreciation. The work is meeting with high favor in all the states, as is evidenced by the fact that in practically all the towns where it has been begun there is almost no opposition to its continuation.[1] Many of the towns in which demonstrations are made continue the drainage work during the winter months and in the spring have the ditching in good order for early work to prevent mosquito breeding.

The town of Crossett, Arkansas, continued control measures during 1921 for the sixth consecutive year at a cost of $5,349 for the year; the town of Hamburg, Arkansas, completed its fifth, and the towns of Lake Village and Dermott, Arkansas, their fourth, successful year of malaria control (Figs. 21 and 22, pages 113 and 114, exhibit results accomplished). In all these towns the bulk of the citizens heartily endorse the work and there is every indication that it will henceforth be carried on as a regular municipal function.

Consolidation and Extension of Service. The work of the year has been characterized by a growing tendency to center control measures in the county health departments, and to arrange through them not only for the initial installation but for subsequent supervision and maintenance. The state boards of health are also taking active interest in the work, and many of them are securing their own malaria control personnel. During the year the Board assisted six of these states—Alabama, Arkansas, Mississippi, Missouri, South Carolina, and Virginia—in providing supervisors to assume direction of comprehensive plans for the control of malaria within their borders. The state boards of health have made creditable progress in securing legislative appropriations for developing and aiding in measures for the control of malaria. It is estimated that six states expended at least $50,000 in this way during 1921. Future plans contemplate the expenditure of much larger sums in this work.

COUNTY-WIDE ANTI-MOSQUITO MEASURES

The effectiveness of county-wide malaria control operations under the direction of a full-time county health officer was demonstrated during the past year in several Alabama counties. The effort grew out of the work conducted during 1920 in several towns of the state, which awakened interest in malaria control and suggested to the State Board the idea of attempting to carry out similar measures in both towns and rural districts

[1] Following the original survey and before control effort is inaugurated the towns agree to defray certain items of expense associated with the work, as well as to set aside in future years the sums necessary for its maintenance. The agreement entered into with the towns contains careful estimates of original installation as well as maintenance costs. Persons who may be interested in the particulars of this phase of the work will be furnished a sample copy of the agreement upon application to the International Health Board, 61 Broadway, New York City.

through the county health departments. A malaria control engineer was added to the staff of the State Board, to co-operate with the county health officers, and Calhoun, Talladega, Sumter, Morgan, and Tuscaloosa counties were selected for the work. From the inception education and publicity were stressed.

Extent of Control Effort Undertaken. Active operations were begun April 1, 1921. By the end of April control effort was going forward in nineteen centers of population. Gradually other towns, and later the inhabitants of certain rural areas, took it up, until by the first of September it was under way in thirty-two towns and in fourteen rural districts. In some towns the regular city employes devoted to the work such time as was needed; in others the town marshal, assisted by prisoners, attended to it; in others still the towns paid nominal fees to some of their citizens. During the progress of operations in the five counties a total of 108 miles of ditches were dug, 1,298 miles of waters were oiled, and 86 miles of vegetation and other obstructions were cleared away from the banks of streams, ponds, and similar bodies of water. In addition 136 separate water deposits were stocked with the larvae-consuming top minnow, for the free distribution of which hatcheries were established at convenient locations in several of the counties.

Results and Cost. In the rural districts of all the counties many streams, lakes, and ponds were stocked with fish and many miles of ditches were dug. In one county in particular, where practically the sole source of Anopheles mosquitoes was stock ponds and small fish ponds, hundreds of these were stocked with Gambusia or were so cleaned by their owners that effective fish control was obtained. As a result a tremendous area was practically freed of Anopheles mosquitoes. The population protected in the several counties was 92,000, the total sum expended $3,108.11, and the cost per capita thirty-four cents.

ANTI-MOSQUITO MEASURES UNDER TROPICAL CONDITIONS

Efforts to adapt to tropical conditions the anti-mosquito measures whose value has been so convincingly demonstrated in the Southern States were continued in Porto Rico and Nicaragua during 1921. In both countries control is being sought by the use of top minnows, supplemented in Nicaragua by drainage and in Porto Rico by drainage and oiling. The complete results of the Porto Rican experiment are not yet known. The data at hand indicate that under tropical agricultural conditions in Porto Rico malaria cannot be controlled unless Anopheles breeding is prevented for a distance of at least 1½ miles from the nearest house.

Demonstration in La Puebla-Rivas, Nicaragua. During March and April, 1921, surveys were made in two towns of Nicaragua—Buenos Aires and La Puebla-Rivas—to determine the feasibility of undertaking malaria control by anti-mosquito measures. The surveys resulted

in the recommendation that experimental effort be undertaken in an area embracing approximately three square miles, forming part of the town of Rivas and the adjoining semi-rural district, really a part of the town, known as La Puebla. The work begun here in June has shown conclusively that anti-mosquito measures are applicable for the control of malaria in tropical towns, certainly under the conditions that exist in the towns of Nicaragua. The undertaking has awakened much interest in neighboring communities, a number of which are requesting assistance along similar lines.

Results and Costs in La Puebla-Rivas. No data are available for physicians' calls in earlier years. However, 43.6 per cent of the total population of 1,416 gave a history of attacks of malaria during the preceding twelve months. Examination of the blood of 200 persons, made for the purpose of checking the history index, yielded 139 positive results among 152 persons who gave positive histories, and indicated the histories to be approximately 90 per cent accurate.

During the period of control effort (June to December, 1921), which includes the period of highest malaria incidence (August to December), 27.7 per cent of the inhabitants had febrile attacks resembling malaria, indicating a diminution in the malaria rate of 36.5 per cent as compared with the incidence for the preceding year. A parasite index of 525 children, taken in August, 1921, and to be repeated in January and February and again in August of 1922, will give a truer estimate of results. There can be little doubt, however, that the degree of protection afforded was much higher than is suggested by the estimated reduction of 36.5 per cent, inasmuch as relapses unquestionably played an important part in raising the 1921 figures.

Excluding the expenditures for general supervision, the work was conducted at a per capita cost of seventy-four cents for the seven months it was in progress, or at an average rate of about one dollar for the year. This cost of original installation is slightly below the average cost of similar work in the Southern States. There is, moreover, every prospect that under Nicaraguan conditions the cost of maintenance will be considerably lower.

CONTROL BY STERILIZATION OF CARRIERS

The Mississippi delta is one of the regions in which the control of mosquito breeding is not economically feasible. In this region, therefore, experimental work in the control of malaria has been concerned with the sterilization of carriers. The work has been conducted under the general supervision of the Mississippi Department of Health and under the scientific direction of Dr. C. C. Bass, Professor of Experimental Medicine in Tulane University. It has been under way since 1916 and has dealt with many thousands of people. In the opinion of Dr. Bass its results indicate that with sufficient quinine available and the people sincerely desirous of being rid of the disease, *malaria may be controlled by quinine treatment alone* in any area of the world.

Extent of Experimental Effort. The study was conducted during 1916 and 1917 in an area of 328 square miles in Bolivar county, Mississippi. As a check on the results accomplished and while the figures for the Bolivar county work were being analyzed, work was also undertaken at the state prison farms in Sunflower and Quitman counties and at Parchman Penitentiary in Sunflower county.

The total population dealt with during the two years was about 35,000. During 1916 the work was conducted in an area of 225 square miles with a population of 20,040. A total of 37,841 blood specimens were examined during the year, and 13,403 quinine treatments were given. During 1917 an additional area of 103 square miles was covered and a large part of the 1916 area was investigated once or oftener to ascertain what effect the quinine treatment of the preceding year had had upon the incidence of malaria. A total of 45,889 blood specimens were examined during this year and 8,774 quinine treatments given.

Method of Treatment Experimentally Developed. The observations made during this two-year period shed considerable light upon many important questions involved in malaria control. Extensive tests of different salts and doses of quinine, carried on during 1917 at the prison farm in Sunflower county—because more dependable observations could be made on convicts than on free living people—together with experiments in methods of treatment followed by resurveys in various other communities during 1917 and 1918, made it possible to develop a standard treatment that gave promise of effectively immunizing the carriers.

Thorough investigations were undertaken to determine such questions as the total amount of quinine necessary to disinfect adults and children, the form in which the drug was most effective, the size of the daily dose, the manner in which the drug could be most conveniently and most effectively administered, the length of time over which treatment should be given, and the time or times of day at which it should be taken. Attention was also devoted to the question of whether or not there are persons to whom, because of a constitutional idiosyncrasy, the drug may not be administered.

Before adoption as part of the standard routine each particular phase of the treatment was experimentally tested and checked from carefully compiled records. The dosage finally decided upon was ten grains of quinine sulphate, with the following proportionate doses for children:

Age	*Proportion of Adult Dose*	*Dose for Children*
Under 1	0.05	½ grain
1 year	0.1	1 grain
2 years	0.2	2 grains
3–4 years	0.3	3 grains
5–7 years	0.4	4 grains
8–10 years	0.6	6 grains
11–14 years	0.8	8 grains
15 and over	1.0	10 grains

The medicine was to be taken at bedtime each night for a period of eight weeks. That the ten grains daily dose was about the smallest dose that could be depended upon to prevent multiplication of the parasites was

shown by the fact that clinical symptoms developed in a few instances among the several thousand persons who were taking it. According to data collected the treatment disinfected more than 90 per cent of the carriers, relapses occurring in very rare instances. The studies indicated that there were few people to whom it was unsafe to administer quinine.

In two communities prophylactic treatment was used; that is, smaller quantities of quinine were administered over a longer period of time—not in an effort to cure or disinfect, but merely to guard against acute attacks. The results indicated that if such treatment were continued during the transmission season for several years, it would effect a great reduction in the incidence of malaria. However, thirty-two persons among the 1,657 who took prophylactic treatment suffered malaria attacks and had to be put upon curative treatment.

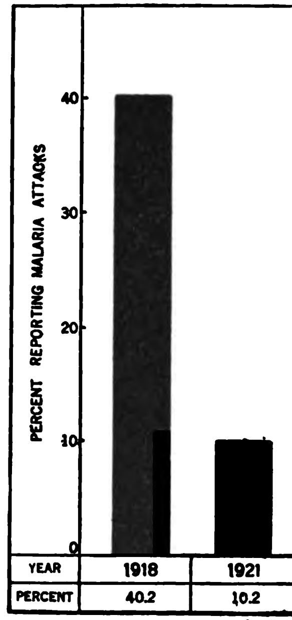


Fig. 59.—Quinine treatment controls malaria. In an area of 100 square miles in Sunflower county, Mississippi, only one third of the infected persons treated in 1918 suffered attacks the following year. Graph based on history index

Test of Treatment in Sunflower County, 1918. The next step was to test the efficacy of the immunizing treatment as a control measure in a typically malarious region. Accordingly, in 1918, a demonstration campaign was inaugurated in an area of 100 square miles located in Sunflower county, Mississippi. This area had a rural population of 8,052, with 1,000 additional persons residing in the town of Ruleville.

The proposed plan called for public meetings to advertise the scope and purpose of the work, for malaria surveys, for the furnishing of free quinine to all persons who gave positive histories or positive blood indices, and for following up the quinine treatment to see that it was taken on a regular weekly schedule. The work was to advance and to enter new communities as rapidly as conditions and facilities would permit.

Modification of Demonstration Effort, 1919–1921. This first demonstration achieved a considerable degree of malaria control. For the next year it was decided to discontinue *free* quinine treatment and to rely on county-wide publicity measures to stimulate the use of quinine in sufficient quantities for a cure. Practically nothing was done during 1919

in the 100 square mile area to hold what had been gained in the 1918 campaign, but the area was resurveyed in an effort to obtain further information about the results of the earlier work. During 1920 and 1921 there was a return to the 100 square mile area and an attempt to effect a further reduction in the incidence of malaria by persuading infected persons to buy the quinine and take the standard treatments. Intensive resurveys of the area were also carried on in both these years.

To summarize, the work of the four demonstration years was as follows:

1918—Intensive work in 100 square mile area.

1919—General publicity measures over entire county to induce infected persons to buy and take standard quinine treatment.
No special work in 100 square mile area except resurveys to determine results of 1918 effort.

1920—Return to 100 square mile area to check up results of 1918 work and to attempt further reduction in prevalence. As far as possible the various communities were taken up in the same order as in 1918. Intensive resurveys were made, complete records kept, and those who had malaria were advised to buy and take the standard quinine treatment.

1921—Same kind of resurvey and follow-up work as in 1920 conducted in 100 square mile area.

Result of Demonstration Effort. In spite of the fact that free distribution of quinine was discontinued at the close of 1918, that the majority of the people in the 100 square mile area were not again reached intensively until about two years later, and that quinine was not furnished them gratuitously even then, malaria was considerably less prevalent in the area at the close of 1920 than it was at the time of the first survey. Definite figures for the reduction accomplished to the end of 1920 cannot be announced until the returns for 1921 surveys have been completely studied. However, the number of cases of malaria per 100,000 residents during 1920 was 34.4 per cent lower in the 100 square mile area than in the whole county, and the death rate per 100,000 population was 65.9 per cent lower. Figures to the end of 1919 indicate, moreover, that the incidence of malaria was only 13.2 per cent among residents of the 100 square mile area who had been treated in 1918, as compared with the incidence of 40.2 per cent that obtained among these people at the time of their first quininization—a reduction of 67.2 per cent. In the intensive work in the 100 square mile area there was expended during 1918 the sum of $8,633.44, during 1920, $3,349.81, and during 1921, $3,454.72. For the respective years the per capita costs were $1.16, $.38, and $.38, or an average for the three years of $.70.[1]

Distribution and Sale of Standard Quinine Packets. The immunizing dose of quinine adopted after the experimental work in Bolivar and Sunflower counties was endorsed by the United States Public

[1] All cost figures exclude the expenditure for general supervision.

Health Service in 1918. In 1919 the National Malaria Committee adopted it and recommended it to practicing physicians and to the publishers of medical textbooks. State and county health departments in Mississippi and other states are now stimulating the distribution and sale of handy packets containing the standard treatment at all drug and crossroad stores. In the Southern States several million doses have been taken. Six hundred thousand were taken in one Georgia county alone during the year 1920. Among the 10,000 persons who took the medicine only twenty-seven developed chills and fever.

Determining the Malaria Carriers.[1] For estimating the prevalence of malaria in original surveys as well as resurveys, a combination of history and blood indices was used. In taking the histories only those persons were recorded as positive who had had attacks within twelve months. Persons who have not had attacks within this period are usually free of the parasites and are not malaria carriers. In no case was the blood of persons giving positive histories examined unless there was some special reason for so doing.

The blood of 31,459 persons was examined one or more times during 1916 and 1917, and malaria parasites were found in 21.2 per cent of the cases. More than half (55.1 per cent) of all the positive cases had stated, previous to blood examination, that they had had one or more attacks of malaria during the preceding twelve months; while 72.4 per cent of those who carried gametes had given a positive history. Thus, as is to be expected, the history index is shown to be more trustworthy when gametes are in the blood than when they are not.

EXPERIMENTS AT MOUND

At Mound, Louisiana, during the malaria seasons of the years 1920 and 1921, representatives of the United States Bureau of Entomology and of the International Health Board have conducted, along parallel lines, various field studies and experiments in malaria control in which the United States Bureau of Fisheries and the United States Bureau of Plant Industry have co-operated with the Bureau of Entomology. The investigations have dealt with control by screening, by the relocation of houses, by killing adult mosquitoes in the houses, by using mosquito netting over beds, and by impounding the water of bayous and depending upon top minnows and wave action to keep down breeding. As an incidental feature of the experiment in relocating houses, Dr. C. G. Bull of the Johns Hopkins School of Hygiene has co-operated in developing a technique for determining definitely the sources of blood meals of mosquitoes.

[1] Dr. Bass's final report will give full details as to the method followed in collecting and staining blood specimens and in microscopically examining specimens for the malaria parasite, as well as his observations on the relative accuracy of different persons who examine specimens in the laboratory and on various other technical subjects which were investigated in an effort to work out a thoroughly satisfactory method of diagnosis.

13

Impounding Water Experiment Highly Promising. Only one of the experiments—that of impounding water in bayous which cannot be drained—has proceeded sufficiently far for definite conclusions to be reached. This method, which was developed originally by the Bureau of Entomology and given further test through the co-operation of the International Health Board, has yielded results far beyond expectation.

The bayous of the Mississippi delta are streams flowing through channels cut by the river at flood. By means of damming, the bayous are converted into a series of lakes. The marginal zone is transformed into a pasture by removing tangled undergrowth along the edges, and domestic animals are introduced to crop close the vegetation along the water's edge and permit the waves and top minnows to act effectively. The maintenance of a water level sufficiently high to suppress the growth of aquatic and semi-aquatic vegetation, and a clear margin, are the essential conditions of success.

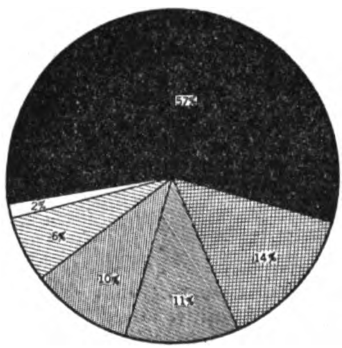


Fig. 60.—Proportionate rates of sickness from malaria and other diseases among rural population of seven counties in Southeast Missouri. Malaria caused 57 per cent of the total illness; digestive diseases, 14 per cent; respiratory diseases, 11 per cent; systemic infections (excluding malaria), 6 per cent; nervous diseases, 2 per cent. Ten per cent of the diseases could not be classified

Results of Impounding Experiment. A survey made more than a year after the completion of impounding gave only one collection of Anopheles larvae within the zone of control. Above and below it numerous specimens were obtained. The elimination of Anopheles breeding in the impounded section seemed to be the result of several factors, among which were: increased water depth, wave action, absence of vegetation near shores, absence of small organic and inorganic particles derived from submerged débris and vegetation, and finally larval reduction by fish.

Economic Return. Apart from the elimination of Anopheles breeding, several economic advantages resulted from the impounding experiment. Much additional pasturage was opened up; animals were provided with plenty of clean water throughout the dry season; and the supply of large edible fish became more abundant through the increased breeding produced under the more favorable conditions of the artificial lakes. The work of clearing the ground and constructing the dams cost only a little more than $600.

A MALARIA SURVEY IN SOUTHEASTERN MISSOURI

In counties or communities where the physicians and the people do not recognize malaria as an outstanding public health problem, surveys are necessary to determine the advisability of using public funds for its prevention. From August to December, 1921, Dr. Mark F. Boyd of the Board's field staff, in service with the Missouri State Board of Health, conducted such a survey in a group of seven counties containing a rural population of 147,845, constituting the southeastern corner of the state. He selected for intensive study a typical rural area of about 141 square miles, containing a population of 2,966. Some of his findings are interesting and significant.

These counties lie on the northern border of the recognized malaria zone for the United States, and yet Dr. Boyd finds malaria responsible for nearly 60 per cent of the illness. About 12 per cent of the entire rural population in the lowlands was found infected, with an estimated general malaria incidence of about 20 per cent. Of the people having attacks of malaria about 36 per cent consult a physician; about 16 per cent have no treatment; and the remainder dose themselves with chill tonics or quinine. None were found who had received what is regarded as the minimal dosage of quinine necessary to make a cure reasonably certain. The people living in open, unscreened houses have four times as much malaria as those living in well-built and well-screened dwellings. Difference in degree of protection against mosquitoes seems to be mainly responsible for the fact that the infection rate was found among farm-hands, 14.6 per cent; among tenants, 10.2 per cent; and among proprietors, 7.3 per cent.

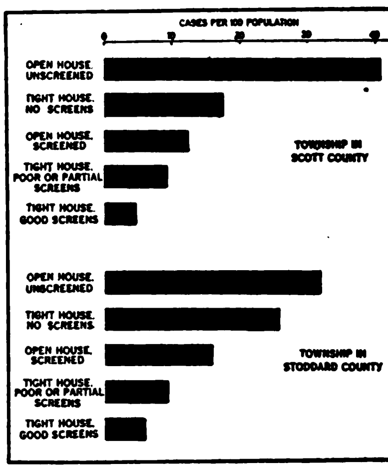


Fig. 61.—Effect of screening and construction of houses on incidence of malaria, two Southeast Missouri townships

The outstanding fact is that malaria in this region is on the decline; and that the principal cause of the decline is systematic agricultural drainage. Dr. Boyd's conclusion is that in this region anopheline control as a health measure is not economically feasible; and that the key to the control of the residual malaria lies in improving housing conditions to provide better protection against mosquitoes and educating the doctors and the people in proper standards of malaria treatment and the importance of effecting a cure (see Fig. 61).

V

FIGHTING MOSQUITOES WITH FISH

Fish played during 1921 a most important rôle in practically all the operations conducted against yellow fever and malaria. During the twenty years that have elapsed since 1900, when the United States Bureau of Fisheries began its investigations into the usefulness of the top minnow for destroying mosquito larvae, many experiments in the use of fish to keep down mosquito breeding had been made in various parts of the world, and some of them had yielded valuable and far-reaching results. Among them may be mentioned the work of the New Jersey Agricultural Experiment Station during the years 1902 to 1911; the observations of Geiger on the use of fish in rice fields near Lonoke, Arkansas; and the experimental work of Hildebrand, of the United States Bureau of Fisheries, near Augusta, Georgia, and elsewhere. Investigators in a number of other countries, particularly in India, have also made valuable contributions.

But the effectiveness of fish as a means of checking the breeding of malaria mosquitoes was first demonstrated under representative agricultural conditions in an experiment carried out by Dr. H. H. Howard in Hinds county, Mississippi, during the years 1918 and 1919. In a district thirty-six square miles in extent, with a population of 830 living in 172 homes, mosquito breeding was successfully controlled by the use of fish aided by only two inspectors. Fish were also used as an auxiliary but very effective measure of mosquito control in the campaign against yellow fever in Guayaquil in 1918 and 1919.

Elimination of Stegomyia Breeding Places in Guayaquil. In the city of Guayaquil, Ecuador, the main breeding places of the yellow fever mosquito—the large water-tanks—were covered and sealed, and fish were placed in the many smaller water containers that could not be so treated. The covering of the tanks greatly reduced the number of yellow fever cases; the use of fish in the smaller containers completed the eradication of the disease. Since then there has not been a single case of yellow fever in Guayaquil. During 1920, at a time when the supply of fish was temporarily exhausted, the percentage of containers other than tanks in which yellow fever mosquitoes were breeding rose rapidly from two to ten. The use of fish effected a notable economy in the cost of the campaign, making possible a reduction of the inspection personnel from 139 to 20.

Fish the Main Reliance in Peruvian Yellow Fever Epidemic, 1920–1921. For combating the severe yellow fever epidemic in Peru during 1920–1921, Dr. Hanson discontinued emptying and filtering and used fish in *all* classes of containers. The total of 750,000 fish that had been distributed by the end of 1921, brought down the mosquito

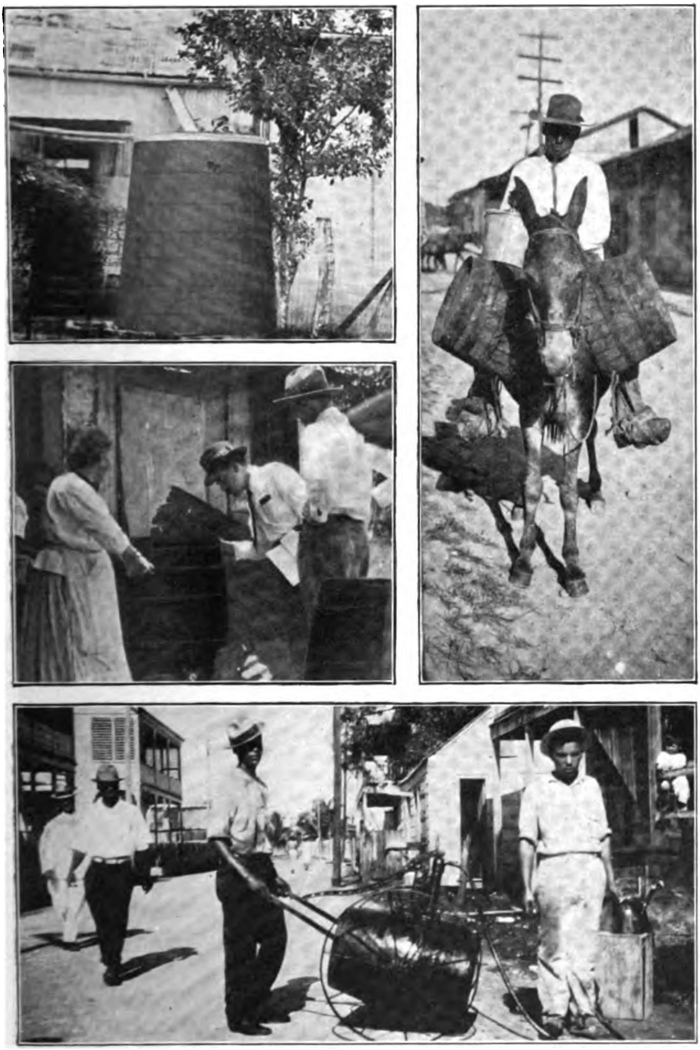


Fig. 62.—Several phases of yellow fever operations in Mexico and Central America. Home with water tank well screened; inspectors examining water barrels to detect possible Stegomyia breeding; fish distributor on way to landing place; oilers visiting homes to oil wells and small pools

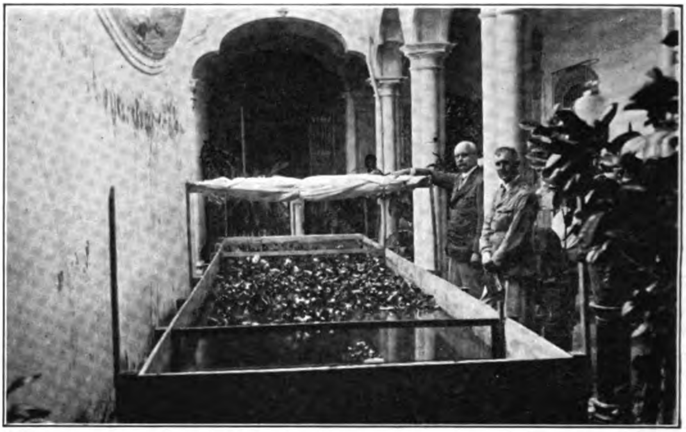


Fig. 63.—Tank at Colima, Mexico, from which are distributed the small fish placed in water containers at the homes. The fish devour the larvae of yellow fever mosquitoes in water containers

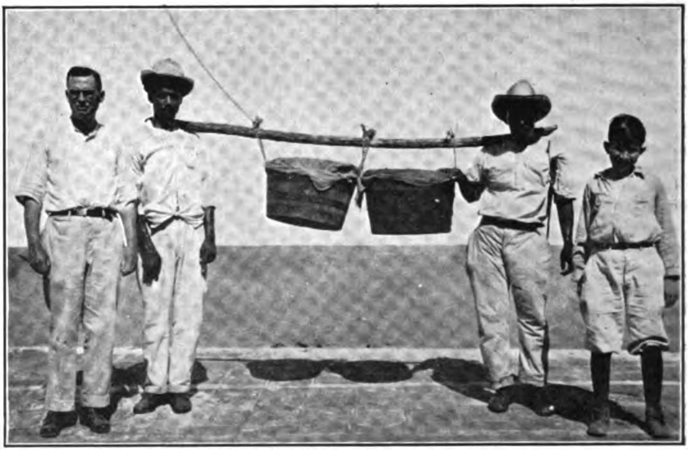


Fig. 64.—Transporting fish from landing place to headquarters. Operations against yellow fever in Túxpan, Mexico

index and held it to a safe limit over the territory lying between the sea and the mountains and extending from the borders of Ecuador to Lima, a region 500 miles long and from fifty to seventy-five miles wide. Dr. Hanson states that in his opinion the control of breeding over so vast an area would have been impossible but for the use of fish.

Fish the Chief Weapon in Mexican Yellow Fever Campaign, 1920–1921. The successful use of fish in other regions led to their being adopted by Le Prince in the summer of 1920 for the eradication of yellow fever in and around Tampico. The plan adopted for this city and the oil camps adjacent to it consisted of an intensive fish campaign in which every type of water container was stocked with suitable fish. As supplementary aids, and for securing control in bodies of water in which fish were not effective, oiling and other methods were resorted to. From a visit to about 500 homes in the city of Tampico in 1921, Dr. Connor estimated that the use of fish had yielded an 80 per cent degree of control.

a. Use of fish in Vera Cruz. Dr. Caldwell, director of the yellow fever control campaign in and around Vera Cruz in 1921, after visiting Tampico in 1920 to familiarize himself with Le Prince's methods, decided upon a campaign along similar lines for Vera Cruz. Fully one half of the containers in this city were of a type that held but little water and could be easily emptied. For these, frequent inspection with emptying and cleaning proved to be the most satisfactory method of control. Containers of the other large class, including barrels, *pozos*, and tanks, were covered where practicable. Where this could not be done, the introduction of fish gave highly satisfactory control. For the few containers and other breeding places that could not be covered and in which fish could not be used, it was necessary to resort to oiling.

b. Fish prove effective in Merida. In Merida, Yucatan, the *aljibe* (stone cistern constructed under the *patio*) was the preferred breeding place of the Stegomyia. Next, in the order named, came tanks, barrels, *lejia*, and smaller containers. To free the *aljibe* of breeding, fish were resorted to because covering was too expensive. Fish were also employed with excellent results in barrels, tanks, and other large containers. Small containers were emptied and their number reduced as much as possible. Dr. Connor, in his report for May, 1921, says that of 12,324 water containers in which fish were used, inspection revealed not a single one harboring larvae or pupae.

Use of Fish in Central America. In Nicaragua fish played a part in controlling the outbreak of yellow fever in Managua in August, 1919. They were not generally used in that country, however, until early in 1921. Dr. Molloy reports that they disappear from small *pilas* filled by taps, and from rain barrels, when the water runs over. In tanks, and in *pilas* filled from wells, however, they have given excellent results.

In the malaria control studies conducted in the department of Rivas, Nicaragua, during 1921, small fish of the Poeciliidae species were relied on

exclusively to control breeding in streams and ponds. With proper clearing away of the underbrush and cleaning of the banks—a very inexpensive process—they yielded satisfactory control. To eliminate the principal breeding places of the region it was necessary merely to clean and straighten the banks of two rivers and give the top minnows a chance to perform their work. Fish were also used with excellent results to stop mosquito breeding in the artificial containers and wells found around houses.

In Salvador fish played an important rôle in maintaining, with a minimum inspection force, low mosquito indices in the principal cities. From hatcheries established in San Salvador and Sonsonate and in the Oriente, fish were widely distributed. In the opinion of Dr. Bailey fish alone would completely eliminate mosquito breeding if it were possible to secure proper care for all distributed and if the thousands of small containers in which they cannot be used could be emptied regularly or done away with.

A striking example of the part fish played in mosquito control is reported from the city of Sonsonate, Salvador. Even with persistent inspection of containers for many weeks it was practically impossible to reduce the house index below 4.2 per cent. Fish were then introduced, and in a very short time the index was reduced to 0.6 per cent. One year after the disappearance of yellow fever from Sonsonate, fish distribution was suspended, with the result that the percentage of houses in which Stegomyia were breeding rose rapidly from about 1 to 9 and the breeding in containers from 0.4 to 5.3 per cent.

In Guatemala fish have been effective in the classes of containers in which they can be used, but Dr. Vaughn reports that of the 30,000 containers in the yellow fever zone of that country only 2,900 are suitable for the use of fish. The larvae in those into which fish were introduced were greatly reduced in numbers despite the high mortality of the fish and the difficulty of keeping the containers adequately stocked.

Control of Malaria in the Southern States. In the Southern States fish are being extensively used to control the breeding of the malaria mosquito. In practically all the towns in which there have been demonstrations of malaria control by anti-mosquito measures during 1920 and 1921, they have been an important auxiliary to drainage and oiling and in many instances the chief or even sole reliance.

In a group of five counties in Alabama practically every farmer has convenient access to a minnow hatchery from which he is able to stock breeding places with fish as occasion arises. The city of Richmond, Virginia, has stocked all its fountains, reservoirs, and lakes with top minnows, and has established hatcheries to furnish the fish free of charge to any communities in the State that want them.

Kinds of Fish to be Used. In each locality a special study must be made of the kinds of fish available, of their habits, and of the conditions under which they are to be used. It is not safe to assume that because a certain species eats mosquito larvae in the laboratory, it will

be useful in an anti-mosquito campaign. The larvae-eating habits of the species must be studied under conditions that closely approach those under which it is to be used. All authorities agree that an indigenous fish is preferable. If an indigenous variety is not used, the imported species must be thoroughly acclimatized and allowed to adjust itself gradually to its new habitat. Small fish of the family Poeciliidae, widely distributed throughout the tropical and temperate zones, are the ones most extensively employed.

VI

COUNTY HEALTH WORK

The county offers a most effective unit of organization for providing adequate health service to the smaller towns and rural communities. The need of such service was strikingly demonstrated by field investigations conducted in the Southern States between the years 1910 and 1915. Study of the sanitary conditions surrounding 274,420 homes in 747 counties in eleven states showed that only 12,145, or 4.4 per cent, had latrine accommodations that could be regarded as satisfactory for the prevention of soil-borne diseases. One hundred thirty-four thousand and eight, or 48.8 per cent of the homes, had no latrines; 128,267 others, or 46.7 per cent of the total, had the grossly insanitary open-seat surface latrines. Only here and there were county health departments maintained, but in such counties the sanitary conditions were better at the time of original inspection, it was easier to secure needed improvements, and the advantages, once gained, were seldom lost.

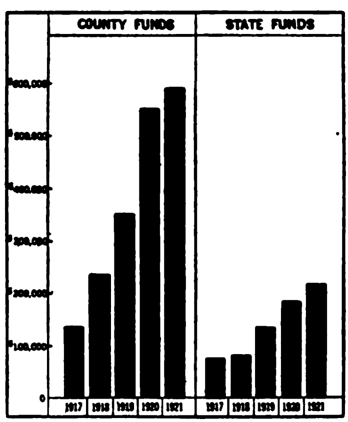


Fig. 65.—Growth in funds set aside for county health work, nine southern states, 1917–1921. Includes appropriations by states, counties, International Health Board, and other agencies

In the development of county health work the Board has been serviceable in providing funds for initial demonstrations. Its contributions have stimulated appropriations by counties and legislatures; and the demonstrations thus supported are creating a sustaining public sentiment. The state and county appropriations usually show wholesome growth from year to year, and are seldom reduced even in the face of the severe economic depression that has necessitated curtailment of many useful forms of service.

SCOPE AND EXTENT OF SERVICE

During the year 1921 co-operative projects in county health organization were carried out with the Board's participation in seventy-seven counties in sixteen states. The total sum appropriated by all the agen-

cies which co-operated in these projects was $758,904, of which the counties themselves provided $344,081, the state boards of health $156,658, and the Board $177,777. The remaining $80,387 came from other sources, including the United States Public Health Service and the American Red Cross, or from municipalities and private corporations or individuals.

During the year 1921 new work was begun or arrangements for beginning it were completed in five states in addition to the twelve[1] in which it was previously in progress. These five states were Florida, Indiana, Louisiana, Maryland, and Missouri. There was thus a total of seventeen states in which operations were under way or contemplated at the close of the year. The extension of the work has been most rapid in North Carolina, which now has twenty-seven full-time health departments, and in Alabama, which has eighteen.

The plan of work pursued by the county health departments has been evolved from experience, is applicable under a wide variety of conditions, and has stood the test of time. Though there are minor differences to meet local conditions, the most important activities, which are more or less common to all the units, group themselves under the following main heads: (1) public health education; (2) sanitation; (3) control of communicable diseases; (4) adult and child hygiene. The demonstrations are so planned as to enable any county to undertake at the start, in a small way and with the least expenditure of money, the line or lines of work which for that particular county give promise of yielding the greatest results in lives saved and sickness prevented. Other activities are added and the health

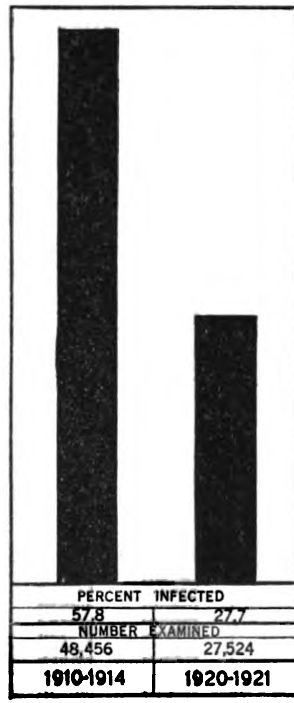


Fig. 66.—Reduction of hookworm infection rates, 1911 to 1921, in fifty-two counties in ten southern states. Based on the original infection surveys of 1911–1914, when 57.8 per cent of 48,456 school children examined were found infected, and the special re-infection surveys made during 1920–1921, when 27.7 per cent of 27,524 school children were found infected

[1] Alabama, Georgia, Kansas, Kentucky, Mississippi, New Mexico, North Carolina, South Carolina, Tennessee, Texas, Virginia, West Virginia.

department is expanded as the work proves effective and additional funds are provided.

PERSONNEL AND BUDGET

The personnel of the average county health department consists of a health officer, a sanitary inspector, an office assistant, and a public health nurse, though the staff is enlarged as occasion requires. The regular personnel serves on a full-time basis—a principle that is considered essential to the success of the work. The usual annual budget for a county of average size is $10,000, though the amount may be increased in the case of larger or more prosperous counties, or be reduced in counties whose population is small or resources limited. Sometimes two or more sparsely settled counties combine to operate a health department.

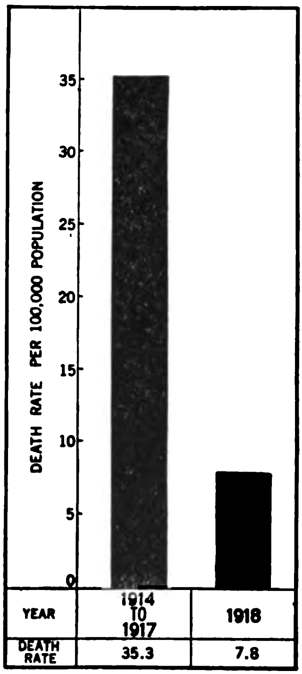


Fig. 67.—Average number of deaths from typhoid fever per hundred thousand population, nine North Carolina counties. Record for years 1914 to 1917, before inauguration of county health work, compared with that for 1918, the year succeeding its inauguration

In no case do the funds appropriated for the health department budget represent the total sum that the county residents devote to health protection. The work of the department invariably stimulates private expenditures for sanitary and other improvements that far exceed the amounts of the county budgets. To cite one of many instances, the citizens of Tazewell county, Virginia, contracted or paid out in four months during 1921 a total of $60,000 for sanitary improvements recommended by the health department, although the total budget for the department during this period amounted to only $3,000.

Public health nurses are being employed in increasing numbers. They furnish a close bond of contact between the health staff and the people. When a case of communicable disease is quarantined a nurse visits the home and gives advice as to the methods to be followed in caring for the patient and in preventing the spread of the disease to other members of the family or to the community; when children are found to be

Fig. 68.—Health officer vaccinating children in rural school of Mason county, Kentucky. Small towns and rural communities, in increasing numbers, are providing themselves with health service of a type that has usually been found only in large cities

Fig. 69.—Trachoma clinic at Maysville, Kentucky, another feature of county health work as conducted in Mason county

Fig. 70.—Class of midwives, with their instructor (second from left), Davidson county, North Carolina. Many of the county health departments are making the instruction of midwives an important feature of their service

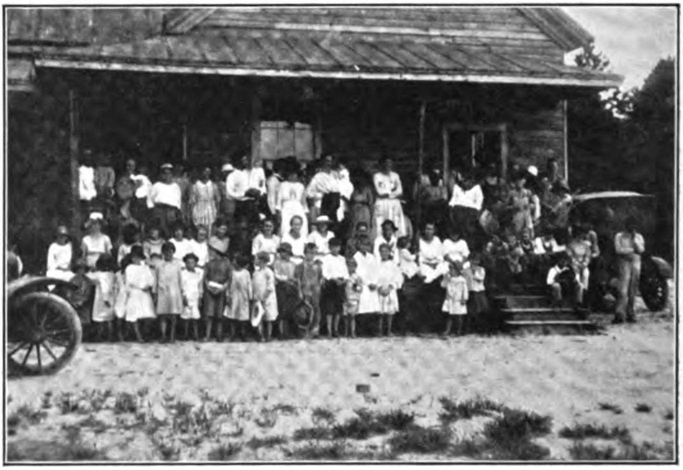


Fig. 71.—Children assembled to receive diphtheria immunization, Tyndale school, Lenoir county, North Carolina. The Schick test and toxin-antitoxin are proving effective weapons in the county health departments' fight against diphtheria

suffering from defects she consults with the parents and urges them to have the defects promptly corrected; and she renders valuable assistance to the health officer in the organization and conduct of clinics, in securing the co-operation of established welfare agencies, and in carrying out the general program of health education and community development.

ACTIVITIES UNDERTAKEN

The report for 1920 discussed somewhat in detail the activities usually embraced in the county health program. Of the newer activities undertaken by several of the departments during 1921, those concerned with county-wide effort for the control of malaria, with the use of the Schick test and toxin-antitoxin for the control of diphtheria, with measures against venereal diseases, and with the improvement of the physical condition of undernourished school children, may be worthy of separate discussion.

Anti-Malaria Work. The malaria operations conducted by the county health departments in Alabama have been fully discussed on pages 191 and 192. In other states also the departments undertook campaigns for mosquito control, advised suspected cases to have their blood microscopically examined and to consult a physician with regard to standard treatment if found positive, and in some instances they supplied free quinine in malarious districts. In the towns of Greenville and Farmville, North Carolina, it is reported that as a result of the anti-malaria work conducted during the past two years under the direction of the Pitt county health department, malaria was reduced at least 75 per cent.

Control of Diphtheria and Venereal Diseases. The health departments in many of the counties made extensive use of the Schick test and of toxin-antitoxin for controlling epidemics of diphtheria in the late summer and fall of 1921, when the disease became quite prevalent in many counties; and in other instances effort was devoted throughout the year to the control of venereal diseases. The measures against the latter disease consisted in the main of clinics, the closing of houses of prostitution, and caring for sufferers to insure their treatment until cured.

Nutritional Work in the Schools. The nutritional work undertaken in a number of counties effected much improvement not only in the weight of the children but also in their ability to keep up with their studies at school. In Montgomery county, Tennessee, 373 pupils from thirteen rural schools gained in weight within three to fifteen weeks an average of three pounds each as a result of such simple measures as serving them daily with milk and hot lunches and urging them to observe precautions in the care of the teeth, sleeping with windows open, and taking daily a sufficient amount of outdoor exercise. In one of the largest schools in this county, with 700 pupils, the percentage of underweight children was reduced during the school term of 1921 from 36 to 14. In

Blount county of the same state 883 children gained in the same period an average of 6.2 pounds.

Miscellaneous Newer Activities. In several South Carolina counties the local physicians organized and held during 1921 free clinics for the treatment of general diseases, with especially good results in Greenwood county; and in Kentucky and Tennessee, where trachoma is widely prevalent in certain sections, a large number of clinics were held for the relief of this disease. In all the counties the problem of insuring pure milk supplies is receiving early attention. For this purpose some of the units have added to their staffs a veterinarian who inspects the product of dairies and other milk-handling establishments and requires that it be brought up to standard.

RESULTS ACCOMPLISHED

The co-operative projects carried out during the year 1921 have yielded results whose value exceeds by many times the sums appropriated. During the year, in addition to the results accomplished in other lines of effort, new latrines were installed or old latrines improved and made sanitary at a total of 34,186 homes; 13,450 cases of communicable diseases were quarantined; 257,526 vaccinations were given for typhoid fever and 83,467 for smallpox; and 257,319 school children were examined for physical defects.

Reduction in Typhoid. Figures 26, 66, 67, and 72, pages 125, 207, 208, and 213, exhibit some of the instances of marked reduction in sickness and death that have been reported. In Alabama typhoid fever declined 60 per cent in the four-year period from 1917 to 1921—a period that exactly coincides with the bringing of the city water supplies throughout the state under the direction of the state health department and with the placing of more than 45 per cent of the state's inhabitants under the protection of county health departments. In a section of Smith county, Tennessee, where for many years there had been a high incidence of typhoid fever, a remarkable reduction resulted from an intensive vaccination campaign in 1919. During the four-year period from 1916 to 1919, inclusive, there were in this area twenty-one deaths from typhoid fever and more than 200 cases. During 1920 not a single case of the disease was reported. In Blount, Montgomery, Roane, and Smith counties the average number of deaths per year from typhoid fever during the period from 1915 to 1919 was 48.2. For the two-year period 1920–1921, following the organization of county health work, the number fell to 22.2, a reduction of 53.9 per cent. In Blount county the authorities estimate that a saving of $69,080 resulted from the service rendered by the county unit in reducing the incidence of typhoid fever.

Control of Smallpox, Diphtheria, and Other Epidemics. In Daviess, Harlan, and Scott counties, Kentucky, where in former years

smallpox claimed a heavy toll, epidemics were averted in 1921 by the prompt action of the county health departments. In neighboring counties the disease was rife. In Harlan county the highest number of cases prevailing at any one time in 1921 was eighteen, as compared with more than 500 in the adjoining county of Bell, which had then no county health department. In Scott county only thirty-one cases of the disease occurred, which were limited to fifteen homes; and in Daviess county only twelve cases developed during the months of April, May, and June, 1921, as compared with 185 cases for the same period in 1920. In Geary county, Kansas, during 1921, the department more than paid for itself

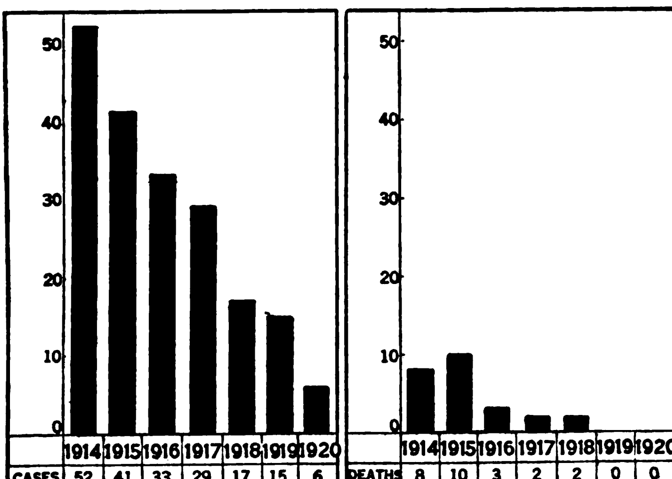


Fig. 72.—Control of typhoid fever in Pearl River county, Mississippi, incidental to the county-wide efforts to guard against pollution of the soil

by preventing a threatened invasion of smallpox. In this county there were only fourteen cases of this disease, all of which were treated in their own homes. In an adjoining county the disease reached alarming proportions, necessitating the establishment of an emergency pest-house at an initial cost of $5,000, a sum greater than that provided by the residents of Geary county for maintaining their health department for one whole year.

In Williamson and Montgomery counties, Tennessee, what threatened to be serious diphtheria epidemics were checked by the prompt action of the county health departments in examining contacts and isolating carriers and positive cases. Scott county, Kentucky, has had in the past two years only one death from diphtheria, whereas several neighboring

Kentucky counties without full-time health departments have had as many as twenty or more. In the city of Santa Fé, New Mexico, a threatened outbreak of scarlet fever was completely checked by daily inspection of school children and exclusion of suspects. The people had become much alarmed when this infection appeared in 1921, as several years before there had been a persistent and widespread outbreak with the deaths running as high as fifteen a day.

Reduction of Hookworm Incidence. The hookworm resurveys carried out during 1920 and 1921 (see discussion, pages 124 to 126) showed that the reduction of hookworm disease has been greatest in the counties in which county health departments have been in operation. This result may be attributed not only to the treatment of infected persons but, and more particularly, to the improvement in sanitation that has been effected in recent years. The resurveys in their turn have proved effective in stimulating public interest in further hookworm control and in general health work. In Baldwin county, Alabama, the authorities estimate that hookworm disease is costing the county not less than $100,000 annually, and the systematic work of the county health department is gradually eliminating this loss.

CONTINUATION AND EXPANSION

The educational value of the work and the demonstration of the benefits to be derived from it find strongest expression in the action of the counties year by year in providing for its continuation and expansion. Coincident with the increase in funds there has been steady increase in the personnel engaged. The benefits of the work in one county, being seen and appreciated in adjoining counties, have led to demands for similar work. In Kentucky during 1921, for example, six additional counties—all of them adjoining counties in which work was already in progress—laid the foundation for whole-time health departments to be organized later.

The state of Ohio, which maintains its county health work independently of outside assistance, stands at the head of the list of states with respect to the number of counties having whole-time health departments. In Virginia, Alabama, Georgia, and North Carolina, however, the number of co-operative county projects has increased with great rapidity. The work has also spread from state to state until, at the close of 1921, it was no longer confined to the Southern States but was under way or contemplated in practically all sections of the country.

Not only are departments once established usually continued, but the appropriations for maintaining them are enlarged year by year, the range of activities undertaken is broadened, and in the end the departments, usually established at first on a trial basis for a period of one to three years, have been made permanent as the results they achieved have demonstrated to the people the wisdom of continuing them. As illustrating the manner in which the funds made available for the work are increased year by year, the record for the following five counties may be cited:

	1917	1918	1919	1920	1921
Mason county, Ky.	$4,400	$6,600	$6,400	$3,500	$10,000
Wilson county, N. C.	3,485	6,205	5,665	8,870	12,196
Davidson county, N. C.	3,485	6,205	5,665	8,741	9,000
Northampton county, N. C.	2,904	6,332	5,702	8,232	9,000
Lenoir county, N. C.	2,904	6,332	5,702	8,482	9,000

COUNTY HEALTH WORK IN OTHER COUNTRIES

As county health work in the United States has been developed and its various lines of procedure have become established on a fairly satisfactory basis, it has in turn served to stimulate more active interest in rural health work in other countries. As a result the Board has been asked to aid in conducting demonstrations in general rural health programs in a number of countries, including Brazil, France, and Czechoslovakia. During the year the first rural health unit in Brazil was established in the county of Sertãozinho, in the state of São Paulo; and the prospects are excellent that within the next two years similar work will be developed in the states of São Paulo, Minas, Rio, and Rio Grande do Sul. With variations in working procedure to meet special conditions, and with adequate local appropriations available, it would seem feasible, through the extension of this type of work to rural regions in many quarters of the globe, to effect the same reduction in sickness and death rates and the same promotion of human welfare that has attended similar effort in the United States.

NOTES ON TABLES

TABLE 1

1. Table 1 on the following pages presents a concise statistical summary—by the main geographical divisions of the work, by states and countries, and by years—of the persons examined and treated in the world-wide campaign for the relief and control of hookworm disease aided by the International Health Board. It shows that in the twelve years from 1910 to 1921, Inclusive, a total of 3,770,624 persons have been examined in thirty-four[1] different states and countries, of whom 2,232,756, or 59.2 per cent, were found infected. Of those infected, 2,020,396, or 90.5 per cent, were given one treatment; while 1,352,550, or 60.6 per cent, received two or more treatments.

2. Two treatments of a standard remedy remove, on the average, from 88 to 95 per cent of the worms harbored, depending upon the drug used and the method of administration; and it is seldom that they leave more than ten worms in the intestine. Thus, though some persons may remain lightly infected after two treatments, this number is nevertheless adequate to establish what may be termed a "practical" cure. One treatment, similarly, removes from 75 to 90 per cent of the worms.

3. Though the figures have been itemized by states and countries and by years, this has not been done primarily to invite comparison of the results for one state with those for another, or of one year's w^rk with that of another. Too many variable factors affect the results for such comparisons to be entirely valid. For instance, among other reasons, the variations or fluctuations may be due to the density of population or severity of infection in the areas of operation, to size of working staff, or to differences in the plan of work pursued. In other instances, as in British Guiana in 1919 and Dutch Guiana in 1921, the figures may represent results for only a few months instead of a complete year.

4. The table includes the results of the early dispensary effort aided by the Rockefeller Sanitary Commission in the Southern States. These figures are not itemized by years, but are reported, under the respective states, as the total for the years 1910 to 1914, inclusive. Some of the work for 1914, separately indicated, was aided by the International Health Board. Since 1915, when work by the dispensary plan ceased in these states, the chief effort against hookworm disease has been directed

[1] See footnote 4, page 228.

toward the building and use of latrines. Therefore the aggregate figures for examination and treatment are not so large as in previous years, nor do they represent in all cases such thoroughgoing effort in the curative phase of the work.

5. In a number of countries operations were suspended during the war and resumed after its close; in others there have been temporary periods of suspension due to industrial depression, lack of trained directors, or similar causes.

6. Only the results of campaigns aided directly by the International Health Board or Rockefeller Sanitary Commission are included. In a number of countries, as in Brazil, government or voluntary agencies are conducting extensive independent campaigns against the disease, the results of which, if they could be included, would substantially increase the aggregate examinations and treatments.

TABLE 2

1. Table 2 shows that in the work of the International Health Board during the years 1913 to 1921, inclusive, a total of $7,493,624.25 was expended. The table is based on expenditures actually made during the respective calendar years. The figures differ from those given in the Treasurer's statements forming part of earlier reports of the Foundation. The Treasurer's reports have included amounts paid in the field during the first three quarters of the respective years, to which have been added in many instances amounts paid during the fourth quarter of one year but not recorded until the first quarter of the succeeding year. The discrepancy is caused by the necessity of closing the Treasurer's books shortly after the first of each calendar year, before detailed financial reports can be received from countries in which a large part of the work of the Board is conducted.

TABLE 1: *Persons Examined and Treated for Hookworm Disease, 1910 to 1921, inclusive, in World-Wide Campaign Aided by International Health Board. Figures by main geographical divisions of work, by states and countries, and by years*

Division, Country, and State	Persons Examined	Persons Found Infected	Persons Given One Treatment[1]	Persons Given Two or More Treatments[2]	Per Cent Found Infected	Per Cent Given One Treatment	Per Cent Given Two or More Treatments
ALL COUNTRIES							
All Years	**3,770,624**	**2,232,756**	**2,020,396**	**1,352,550**	**59.2**	**90.5**	**60.6**
1910–1914	1,179,406	458,606	441,408	213,488	38.9	96.2	46.6
1914	35,397	17,791	16,106	11,925	50.3	90.5	67.0
1915	164,293	94,938	86,242	60,340	57.8	90.8	63.6
1916	223,976	133,744	126,834	93,302	59.7	94.8	69.8
1917	294,367	183,846	168,345	136,889	62.5	91.6	74.5
1918	374,330	249,103	215,394	164,577	66.5	86.5	66.1
1919	397,423	272,351	237,944	202,153	68.5	87.4	74.2
1920	479,916	340,456	297,322	240,983	70.9	87.3	70.8
1921	621,516	481,921	430,801	228,893	77.5	89.4	47.5
DIVISIONS							
SOUTHERN STATES							
All Years	**1,413,000**	**518,668**	**498,333**	**239,921**	**36.7**	**96.1**	**46.3**
1910–1914	1,179,406	458,606	441,408	213,488	38.9	96.2	46.6
1914	9,211	2,434	2,264	653	26.4	93.0	26.8
1915	18,145	3,961	3,779	931	21.8	95.4	23.5
1916	22,169	4,569	4,544	2,939	20.6	99.5	64.3
1917	37,299	7,834	7,596	6,293	21.0	97.0	80.3
1918	44,241	8,074	7,636	4,681	18.3	94.6	58.0
1919	26,282	10,266	9,391	6,689	39.1	91.5	65.2
1920	44,644	12,732	12,528	1,554	28.5	98.4	12.2
1921	31,603	10,192	9,187	2,693	32.3	90.1	26.4

West Indies							
All Years	309,439	190,611	194,772	155,951	61.6	91.7	81.8
1915	63,062	38,026	33,648	24,559	60.3	88.5	64.6
1916	62,642	36,582	33,077	28,811	58.4	90.4	78.8
1917	75,779	46,051	42,739	40,738	60.8	92.8	88.5
1918	31,314	23,636	22,057	20,604	75.5	93.3	87.2
1919	20,350	14,537	13,534	12,962	71.4	93.1	89.2
1920	28,890	16,067	15,274	14,395	55.6	95.1	89.6
1921	27,402	15,712	14,443	13,882	63.6	91.9	88.4
Central America							
All Years	949,398	581,078	520,603	385,627	61.3	89.6	66.4
1914	5,321	2,907	2,562	578	54.6	88.1	19.9
1915	83,086	52,951	48,815	34,850	63.7	92.2	65.8
1916	131,520	85,235	82,461	57,534	64.8	96.7	67.5
1917	126,916	77,482	71,725	46,906	61.0	92.6	60.5
1918	169,531	107,449	94,176	71,078	63.5	87.6	66.2
1919	175,201	98,857	86,079	69,572	56.4	87.1	70.4
1920	134,439	77,537	67,160	50,427	57.7	86.6	65.0
1921	122,384	78,660	67,625	54,682	64.3	86.0	69.5
South America							
All Years	420,807	343,738	291,429	215,820	81.7	84.8	62.8
1918	10,490	6,922	5,894	4,208	66.0	85.1	60.8
1919	50,036	31,318	27,250	21,456	62.6	87.0	68.5
1920	109,337	83,475	73,901	61,276	76.4	88.5	73.4
1921	250,944	222,023	184,384	128,880	88.5	83.0	58.0
The East							
All Years	678,980	598,661	535,259	355,231	88.2	89.4	59.3
1914	20,865	12,450	11,280	10,694	59.7	90.6	85.9
1916	7,645	7,358	6,752	4,018	96.2	91.8	54.6
1917	54,373	52,479	46,285	42,952	96.5	88.2	81.8
1918	118,754	103,022	85,631	64,006	86.8	83.1	62.1
1919	125,554	117,373	101,690	91,474	93.5	86.7	78.0
1920	162,606	150,645	128,459	113,331	92.6	85.3	75.2
1921	189,183	155,334	155,162	28,756	82.1	90.9	18.5

TABLE 1—*Continued*

Division, Country, and State	Persons Examined	Persons Found Infected	Persons Given One Treatment[1]	Persons Given Two or More Treatments[2]	Per Cent Found Infected	Per Cent Given One Treatment	Per Cent Given Two or More Treatments
SOUTHERN STATES							
Alabama							
All Years	86,995	48,852	48,114	13,370	56.2	98.5	27.4
1910–1914	74,473	43,718	43,520	9,857	58.7	99.5	22.5
1917[3]	564	47	47	42	8.3	....	....
1918[3]	675	79	79	79	11.7	....	....
1919	102	17	17	15	16.7	....	....
1920	4,574	1,335	1,334	1,227	29.2	99.9	91.9
1921	6,607	3,656	3,117	2,150	55.3	85.3	58.8
Arkansas							
All Years	48,483	8,866	6,705	1,614	18.3	75.6	18.2
1910–1914	47,983	8,863	6,702	1,614	18.5	75.6	18.2
1918[3]	500	3	3	....	.6	....	....
Georgia							
All Years	75,341	46,058	45,552	14,251	61.1	98.9	30.9
1910–1914	73,518	45,564	45,095	14,023	62.0	99.0	30.8
1919	1,518	373	336	107	24.6	90.1	28.7
1920[3]	305	121	121	121	39.7	100.0	100.0
Kentucky							
All Years	134,855	44,404	38,611	872	32.9	87.0	2.0
1910–1914	128,991	43,635	37,916	475	34.6	86.9	1.1
1915[3]	1,833	460	460	316	25.1	100.0	68.7
1920	2,541	169	116	56	6.6	68.6	33.1
1921	1,490	140	119	25	9.4	85.0	17.9

Louisiana							
All Years	74,368	39,342	38,556	14,858	52.9	98.0	37.8
1910–1914	68,165	37,720	37,225	14,524	55.3	98.7	38.5
1914 [3]	2,568	879	876	324	34.2	98.5	36.9
1918 [3]	1,161	208	55	....	17.9	26.4	....
1921	2,474	535	400	10	21.6	74.8	1.9
Mississippi							
All Years	280,707	109,809	108,323	74,496	39.1	98.6	67.8
1910–1914	184,944	75,813	74,598	58,687	41.0	98.4	77.4
1915	4,414	1,422	1,410	53	32.2	99.2	3.7
1916	3,780	1,466	1,455	1,182	38.8	99.2	80.6
1917	14,874	4,348	4,228	4,223	29.2	97.1	97.1
1918 [3]	8,468	4,084	4,069	3,541	48.2	99.6	86.7
1919	16,036	8,479	8,471	6,461	52.9	99.9	76.2
1920	31,198	9,730	9,720	42	31.3	99.9	.4
1921	17,043	4,467	4,377	307	26.2	98.0	6.9
North Carolina							
All Years	337,179	112,639	106,828	60,264	33.4	94.8	53.5
1910–1914	300,457	104,279	99,075	57,538	34.7	95.0	55.2
1914 [3]	4,837	1,429	1,321	294	29.5	92.4	20.6
1915 [3]	3,405	898	802	228	26.4	89.3	25.4
1917	9,048	2,057	1,984	1,149	22.7	96.5	55.9
1918	18,431	3,503	3,272	987	19.0	93.4	28.2
1920	728	238	142	....	32.7	59.7	....
1921	273	235	232	68	86.1	98.7	28.9
South Carolina							
All Years	101,442	47,696	45,812	22,853	47.0	96.0	47.9
1910–1914	81,311	42,677	41,751	21,413	52.5	97.8	50.2
1914 [3]	840	90	31	4	10.7	....	....
1915 [3]	3,581	721	648	230	20.1	89.9	31.9
1916	6,665	1,991	1,980	1,206	29.9	99.4	60.6

TABLE 1—*Continued*

Division, Country, and State	Persons Examined	Persons Found Infected	Persons Given One Treatment[1]	Persons Given Two or More Treatments[2]	Per Cent Found Infected	Per Cent Given One Treatment	Per Cent Given Two or More Treatments
South Carolina—Cont'd.							
1918[3]	931	24	....	....	2.6	....	....
1919	4,966	1,057	327	....	21.3	30.9	....
1920	2,268	989	965	....	43.6	97.6	....
1921	880	147	110	....	16.7	74.8	....
Tennessee							
All Years	81,582	22,310	21,680	16,087	27.3	97.2	72.1
1910–1914	74,997	21,410	20,979	15,828	28.5	98.0	73.9
1915[3]	1,172	116	116	20	9.9	100.0	17.2
1916	1,217	49	48	23	4.0	....	....
1917	856	129	126	71	15.1	97.7	55.0
1918	127	3	3	2	2.4	....	....
1919	378	17	9	3	4.5	....	....
1920	608	26	17	7	4.3	....	....
1921	2,227	560	382	133	25.1	68.2	23.8
Texas							
All Years	89,482	19,947	19,492	4,861	22.3	97.7	24.4
1910–1914	63,376	17,790	17,490	3,588	28.1	98.3	20.2
1916[3]	2,801	570	568	357	20.3	99.6	62.6
1917	7,084	1,058	1,021	662	14.9	96.5	62.6
1918	11,025	81	70	51	.7	....	....
1919	3,044	322	230	103	10.6	71.4	32.0
1920	2,115	123	112	100	5.8	91.1	81.3
1921	37	3	1	....	....	....	....

Virginia							
All Years	**102,516**	**18,745**	**18,660**	**16,395**	**18.3**	**99.5**	**87.5**
1910–1914	81,191	17,137	17,057	15,941	21.1	99.5	93.0
1914[3]	966	36	36	31	3.7	....	....
1915[3]	3,740	344	343	84	9.2	99.7	24.4
1916	7,706	493	493	171	6.4	100.0	34.7
1917	4,873	195	195	146	4.0	100.0	74.9
1918	2,923	89	85	21	3.0	....	....
1919	238	1	1	....	.4	....	....
1920[3]	307	1	1	1	.3	....	....
1921	572	449	449	....	78.5	100.0	....
WEST INDIES							
Antigua							
All Years	**18,599**	**2,919**	**2,634**	**2,566**	**15.7**	**90.2**	**87.9**
1916[3]	7,477	2,229	2,054	2,031	29.8	92.1	91.1
1917[3]	11,122	690	580	535	6.2	84.1	77.5
British Guiana							
All Years	**71,322**	**44,073**	**39,906**	**35,394**	**61.8**	**90.5**	**80.3**
1915	21,070	13,135	11,903	10,039	62.3	90.6	76.4
1916	18,498	9,808	8,263	6,225	53.0	84.2	63.5
1917	16,044	9,508	8,906	8,722	59.3	93.7	91.7
1918	11,719	8,727	8,175	7,900	74.5	93.7	90.5
1919[3]	3,991	2,895	2,659	2,508	72.5	91.8	86.6
Dutch Guiana							
All Years	**18,494**	**16,762**	**15,544**	**14,792**	**90.6**	**92.7**	**88.2**
1916	4,411	3,900	3,667	3,414	88.4	94.0	87.5
1917	13,159	12,045	11,133	10,664	91.5	92.4	88.5
1921[3]	924	817	744	714	88.4	91.1	87.4
Grenada							
All Years	**33,164**	**22,120**	**20,571**	**15,650**	**65.2**	**99.6**	**70.8**
1915	20,042	12,652	11,522	8,064	63.1	91.1	63.7
1916	5,312	4,226	4,147	2,950	79.6	98.1	69.8
1917	7,810	5,242	4,902	4,636	67.1	93.5	88.4

TABLE 1—*Continued*

Division, Country, and State	Persons Examined	Persons Found Infected	Persons Given One Treatment[1]	Persons Given Two or More Treatments[2]	Per Cent Found Infected	Per Cent Given One Treatment	Per Cent Given Two or More Treatments
Jamaica							
All Years	26,397	8,552	7,705	7,129	32.4	90.1	83.4
1919[3]	2,842	1,552	1,346	1,291	54.6	86.7	83.2
1920[3]	13,748	3,915	3,605	3,203	28.5	92.1	81.8
1921	9,807	3,085	2,754	2,635	31.5	89.3	85.4
St. Lucia							
All Years	37,436	22,572	21,589	17,661	60.3	95.6	78.2
1915	7,924	4,436	4,106	2,177	56.0	92.6	49.1
1916	6,003	2,336	2,201	1,904	38.9	94.2	81.5
1917	4,601	3,060	2,962	2,653	66.5	96.8	86.7
1918	5,004	3,126	2,892	2,068	62.5	92.5	66.2
1919	4,350	2,597	2,547	2,364	59.7	98.1	91.0
1920	6,373	4,743	4,656	4,331	74.4	98.2	91.3
1921	3,181	2,274	2,225	2,164	71.5	97.8	95.2
St. Vincent							
All Years	21,915	12,758	11,905	11,383	58.2	93.3	89.2
1915[3]	3,822	1,676	1,590	1,562	43.9	94.9	93.2
1916	7,494	4,062	3,748	3,653	54.2	92.3	89.9
1917	9,482	6,065	5,683	5,303	64.0	93.7	87.4
1918[3]	1,117	955	884	865	85.5	92.6	90.6

Trinidad							
All Years	82,112	60,855	54,918	51,376	74.1	90.2	84.4
1915[4]	10,204	6,127	4,527	2,717	60.0	73.9	44.3
1916	13,447	10,021	8,997	8,634	74.5	89.8	86.2
1917	13,561	9,441	8,573	8,225	69.6	90.8	87.1
1918	13,474	10,828	10,106	9,771	80.4	93.3	90.2
1919[3]	9,167	7,493	6,982	6,799	81.7	93.2	90.7
1920	8,769	7,409	7,013	6,861	84.5	94.7	92.6
1921	13,490	9,536	8,720	8,369	70.7	91.4	87.8
CENTRAL AMERICA							
Costa Rica							
All Years	303,106	158,358	146,622	101,802	52.3	2.6	64.3
1915	30,297	19,401	18,816	12,152	64.0	97.0	62.6
1916	40,579	22,608	22,037	9,899	55.7	97.5	43.8
1917	48,488	29,940	28,909	19,180	61.7	96.6	64.1
1918	56,371	29,898	27,487	19,154	53.0	91.9	64.1
1919	64,371	29,872	26,551	22,798	46.4	88.9	76.3
1920[3]	30,575	9,700	8,163	6,368	31.7	84.2	65.6
1921	32,425	16,939	14,659	12,251	52.2	86.5	72.3
Guatemala							
All Years	201,250	131,558	117,380	106,283	65.4	89.2	80.8
1915[3]	25,587	15,001	13,783	11,851	58.6	91.9	79.0
1916	39,596	26,665	25,961	23,618	67.3	97.4	88.6
1917[3]	12,934	7,095	6,693	6,518	54.9	94.3	91.9
1918[3]	32,861	22,299	19,950	19,057	67.9	89.5	85.5
1919	44,495	28,752	25,283	23,639	64.6	87.9	82.2
1920	21,460	12,805	11,429	10,402	59.7	89.3	81.2
1921	24,317	18,941	14,281	11,198	77.9	75.4	59.1

TABLE 1—*Continued*

Division, Country, and State	Persons Examined	Persons Found Infected	Persons Given One Treatment [1]	Persons Given Two or More Treatments [2]	Per Cent Found Infected	Per Cent Given One Treatment	Per Cent Given Two or More Treatments
Nicaragua							
All Years	**129,780**	**88,036**	**78,869**	**45,010**	**67.8**	**89.6**	**51.1**
1915 [3]	2,192	1,659	1,298	18	75.7	78.2	1.1
1916 [3]	12,829	9,073	8,362	1,166	70.7	92.2	12.9
1917	33,781	18,422	16,950	5,388	54.5	92.0	29.2
1918	19,786	15,016	13,679	9,286	75.9	91.1	61.8
1919	12,246	5,820	4,829	1,657	47.5	83.0	28.5
1920	33,128	25,272	22,035	16,615	76.3	87.2	65.7
1921	15,818	12,774	11,716	10,880	80.8	91.7	85.2
Panama							
All Years	**125,979**	**99,381**	**90,486**	**68,450**	**78.9**	**91.0**	**68.9**
1914 [3]	5,321	2,907	2,562	578	54.6	88.1	19.9
1915	25,010	16,890	14,918	10,829	67.5	88.3	64.1
1916	30,094	24,193	23,747	21,340	80.4	98.2	88.2
1917	16,676	14,088	13,262	11,126	84.5	94.1	79.0
1918	16,185	13,656	11,966	9,537	84.4	87.6	69.8
1919	15,307	13,490	11,812	8,313	88.1	87.6	61.6
1920	13,104	10,050	8,353	4,009	76.7	83.1	39.9
1921	4,282	4,107	3,866	2,718	95.9	94.1	66.2
Salvador							
All Years	**188,283**	**103,745**	**87,246**	**64,082**	**55.1**	**84.1**	**61.8**
1916 [3]	8,422	2,696	2,354	1,511	32.0	87.3	56.0
1917	15,037	7,937	5,911	4,694	52.8	74.5	59.1
1918	44,328	26,580	21,094	14,044	60.0	79.4	52.8
1919	38,782	20,923	17,604	13,165	54.0	84.1	62.9
1920	36,172	19,710	17,180	13,033	54.5	87.2	66.1
1921	45,542	25,899	23,103	17,635	56.9	89.2	68.1

South America							
Brazil [4]							
All Years	375,568	300,932	250,684	179,501	80.1	83.3	59.6
1918 [3]	10,490	6,922	5,894	4,208	66.0	85.1	60.8
1919	50,036	31,318	27,250	21,456	62.6	87.0	68.5
1920	102,474	77,432	68,207	56,923	75.6	88.1	73.5
1921	212,568	185,260	149,333	96,914	87.2	80.6	52.3
Colombia							
Both Years	45,239	42,806	40,745	36,319	94.6	95.2	84.8
1920 [3]	6,863	6,043	5,694	4,353	88.1	94.2	72.0
1921	38,376	36,763	35,051	31,966	95.8	95.3	87.0
The East							
Australia [4]							
Both Years	38,224	2,193	2,075	1,609	5.7	94.6	73.4
1920 [3]	5,008	350	345	345	7.0	98.6	98.6
1921	33,216	1,843	1,730	1,264	5.5	93.9	68.6
Borneo							
1921 [3]	11,337	10,568	10,568	9,951	93.2	100.0	94.2
Ceylon							
All Years	384,099	372,587	319,698	297,973	97.0	85.8	80.0
1916 [3]	7,645	7,358	6,752	4,018	96.2	91.8	54.6
1917	42,828	41,613	35,675	33,440	97.2	85.7	80.4
1918	61,287	59,448	50,374	47,181	97.0 [5]	84.7	79.4
1919	107,190	103,974	88,602	84,712	97.0 [5]	85.2	81.5
1920	143,482	139,177	117,337	112,089	97.0 [5]	84.3	80.5
1921	21,667	21,017	20,958	16,533	97.0 [5]	99.7	78.7
China							
Both Years	14,529	8,493	6,542	2,669	58.5	77.0	31.4
1918 [3]	12,504	7,556	5,694	2,519	60.4	75.4	33.8
1919 [3]	2,025	937	848	150	46.3	90.5	16.0

TABLE 1—*Continued*

Division, Country, and State	Persons Examined	Persons Found Infected	Persons Given One Treatment[1]	Persons Given Two or More Treatments[2]	Per Cent Found Infected	Per Cent Given One Treatment	Per Cent Given Two or More Treatments
Egypt							
1914	20,865	12,450	11,280	10,694	59.7	90.6	85.9
Fiji							
Both Years	6,624	5,975	5,780	5,551	90.2	96.7	92.9
1917 [3]	3,434	3,088	3,010	2,877	89.9	97.5	93.2
1918 [3]	3,190	2,887	2,770	2,674	90.5	95.9	92.6
Seychelles							
All Years	30,912	24,717	23,826	22,537	80.0	96.4	91.2
1917 [3]	8,111	7,778	7,600	6,635	95.9	97.7	85.3
1918	10,475	9,113	8,671	8,449	87.0	95.1	92.7
1919	10,801	6,924	6,702	6,612	64.1	96.8	95.5
1920 [3]	1,525	902	853	841	59.1	94.6	93.2
Siam							
All Years	172,390	161,678	155,490	2,247	93.8	96.2	2.6
1918	31,298	24,018	18,122	3,183	76.7	75.5	13.3
1919	5,538	5,538	5,538	....	100.0	100.0	....
1920 [3]	12,591	10,216	9,924	56	81.1	97.1	.5
1921	122,963	121,906	121,906	1,008	99.1	100.0	.8

[1] One treatment removes from 75 to 90 per cent of worms; see page 216.
[2] Two treatments remove from 88 to 95 per cent of worms; see page 216.
[3] Represents part-year effort only.
[4] States of Brazil and Australia not indicated separately.
[5] Treatment administered without preliminary diagnosis. Extensive study had previously demonstrated practically every person to be infected.

TABLE 2: *Expenditures of the International Health Board for the*

Activity, State, and Country	July 1, 1913 Dec. 31, 1914	1915	1916	1917
Grand Total........	**$157,731.08**	**$333,461.91**	**$506,087.48**	**$578,367.75**
Relief and Control of Hookworm Disease..	93,202.74	234,592.13	306,574.04	369,988.49
County Health Work.	....	....	....	182.95
Malaria Control.....	....	....	54,496.97	39,978.58
Yellow Fever Control	....	....	41,863.17	9,344.03
Tuberculosis in France.............	....	....	....	51,856.24
Public Health Education.............	....	....	9,256.74	12,376.63
Public Health Laboratory Service.......	....	....	....	....
Philippine Hospital Ship...............	....	25,000.00	....	....
Investigation of Sewage Disposal at Rural Homes......	....	....	664.39	5,359.11
Field Staff Salaries, Expenses, etc., not Prorated to Specific Budgets.......	15,351.20	9,877.95	4,687.45	9,232.30
Miscellaneous.......	15,138.35	15,057.65	27,628.35	18,191.76
Administration.......	34,038.79	48,934.18	60,916.37	61,857.66
Relief and Control of Hookworm Disease	**93,202.74**	**234,592.13**	**306,574.04**	**369,988.49**
Southern States[1]...	....	89,565.64	47,565.09	53.446.11
West Indies.......	38,707.33	52,393.83	88,845.12	87,764.12
Central America ...	19,552.54	55,379.47	88,123.29	98,483.25
South America.....	....	....	4,779.77	43,309.16
The East..........	19,466.66	37,253.19	77,260.77	84,912.45
Miscellaneous......	15,476.21	....	....	2,073.40
Southern States:[1]	....	**89,565.64**	**47,565.09**	**53,446.11**
Alabama..........	....	4,343.33	....	1,235.97
Arkansas.........	....	....	....	2,462.59
Georgia..........	....	22,822.59	....	2,436.95
Kentucky.........	....	9,766.49	4,866.63	2,200.00
Louisiana.........	....	529.38	1,813.19	1,278.66
Mississippi........	....	11,719.14	8,786.77	9,223.36
North Carolina....	....	3,026.99	3,282.34	8,548.71
South Carolina.....	....	5,872.56	5,643.52	7,967.22
Tennessee.........	....	11,889.72	5,797.57	6,585.02
Texas............	....	8,175.55	9,971.36	5,170.48

[1] In September, 1917, the hookworm work in the Southern States began to be absorbed in the
being longer in some states than in others, it was not possible to announce until the end of 1920
regular functions, responsibility for all efforts directed toward the relief and control of hookworm

Years 1913–1914 to 1921, Inclusive, Covering All Activities

1918	1919	1920	1921	Total
$1,121,862.86	**$1,436,355.00**	**$1,658,572.61**	**$1,701,185.96**	**$7,493,624.65**
457,953.94	509,091.99	621,520.98	457,486.99	3,050,411.30
2,494.53	2,439.25	8,182.77	167,765.19	181,064.69
26,489.29	34,965.08	133,929.02	150,551.39	440,410.33
46,639.17	94,526.42	139,757.40	239,057.53	571,187.72
433,030.43	602,775.78	518,013.51	359,540.31	1,965,216.27
36,642.82	38,367.71	68,373.54	89,094.44	254,111.88
....	....	....	16,109.70	16,109.70
12,500.00	6,500.00	....	....	44,000.00
4,288.01	778.60	....	....	11,090.11
5,345.82	21,701.87	26,074.89	38,936.95	131,208.43
23,034.17	46,901.63	51,248.30	59,652.90	256,853.11
73,444.68	78,306.67	91,472.20	122,990.56	571,961.11
457,953.94	**509,091.99**	**621,520.98**	**457,486.99**	**3,050,411.30**
87,284.58	110,860.17	136,019.06	15,730.39	540,471.04
57,800.06	48,457.24	61,857.73	85,541.60	521,367.03
113,545.86	111,684.19	98,303.98	77,920.73	662,993.31
97,031.00	157,555.86	206,486.22	150,422.24	659,584.25
97,932.47	80,014.39	113,472.55	121,805.46	632,117.94
4,359.97	520.14	5,381.44	6,066.57	33,877.73
87,284.58	**110,860.17**	**136,019.06**	**15,730.39**	**540,471.04**
5,922.09	5,283.74	17,256.71	....	34,041.84
2,784.41	....	....	....	5,247.00
5,418.95	4,604.21	4,525.39	....	39,808.09
2,064.97	1,978.40	16,599.03	....	37,475.52
1,317.93	1,370.18	....	....	6,309.34
9,427.52	15,773.21	20,709.72	....	75,639.72
15,775.89	13,924.04	10,463.00	....	55,020.97
13,870.12	14,754.86	17,210.63	....	65,318.91
6,642.20	10,201.59	13,533.22	....	54,649.32
9,362.85	22,380.20	14,723.99	....	69,784.43

programs of the rapidly developing county departments of health. The period of transition
that in all the states the county health departments would henceforth assume as one of their
and other soil-borne diseases.

TABLE 2: *Expenditures of the International Health Board for the*

Activity, State, and Country	July 1, 1913 Dec. 31, 1914	1915	1916	1917
Relief and Control of Hookworm Disease—*Continued*				
Southern States—*Cont'd*				
Virginia..........	$........	$6,622.97	$7,403.71	$6,337.15
Administration.....	....	....	....	....
County Dispensary Work in the South	....	4,796.92	....	....
Resurveys.........	....	....	....	....
West Indies:	38,707.33	52,393.83	88,845.12	87,764.12
Antigua...........	3,780.06	1,738.23	9,316.68	4,758.87
Barbados (survey)..	....	....	1,651.31	....
British Guiana[1] ...	9,711.36	13,300.06	18,554.45	19,231.23
Cayman Islands (survey)........	....	....	....	1,795.16
Dutch Guiana[1]	....	3,260.93	11,672.46	19,168.40
Grenada..........	7,003.76	10,593.37	10,154.65	7,778.80
Jamaica..........	....	....	....	....
Porto Rico........	....	....	....	....
Santo Domingo (survey)........	....	....	....	....
St. Lucia.........	4,742.30	6,048.76	6,295.20	6,865.60
St. Vincent........	4,335.18	4,834.00	6,825.15	9,384.18
Tobago (survey)...	....	....	....	1,072.22
Trinidad..........	9,134.67	8,242.19	15,104.04	10,898.37
Administration.....	....	4,376.29	9,271.18	6,811.29
Central America:	19,552.54	55,379.47	88,123.29	98,483.25
British Honduras (survey)........	....	....	4,273.47	....
Costa Rica........	9,174.60	16,913.06	18,089.98	21,752.31
Guatemala........	185.53	10,432.69	11,954.29	13,346.70
Nicaragua........	375.00	7,587.80	18,430.69	19,418.74
Panama..........	9,817.41	18,828.55	24,449.62	22,881.75
Salvador..........	....	....	10,925.24	21,083.75
Administration.....	....	1,617.37	....	....
South America:	....	....	4,779.77	43,309.16
Brazil............	....	....	4,779.77	43,309.16
Colombia.........	....	....	....	....

[1] For administrative reasons British and Dutch Guiana, although on

Years 1913–1914 to 1921, Inclusive, Covering All Activities—Cont'd

1918	1919	1920	1921	Total
$5,947.86	$10,012.42	$14,965.17	$........	$51,289.28
8,749.79	10,577.32	6,032.20	....	25,359.31
....	....	....	....	4,796.92
....	....	....	15,730.39	15,730.39
57,800.06	**48,457.24**	**61,857.73**	**85,541.60**	**521,367.03**
....	....	....	....	19,593.84
....	....	....	....	1,651.31
16,504.11	9,984.28	486.37	1,281.02	89,052.88
....	....	....	....	1,795.16
4,389.11	613.23	570.34	12,917.66	52,592.13
1,833.74	....	....	....	37,364.32
3,937.85	9,832.48	18,400.09	16,949.24	49,119.66
....	....	7,823.35	18,290.86	26,114.21
....	....	1,077.07	....	1,077.07
8,152.28	8,109.32	11,444.57	8,545.88	60,203.91
6,383.25	....	....	17,489.50	49,251.26
....	....	....	....	1,072.22
12,301.48	15,293.43	16,016.71	....	86,990.89
4,298.24	4,624.50	6,039.23	10,067.44	45,488.17
113,545.86	**111,684.19**	**98,303.98**	**77,920.73**	**662,993.31**
....	....	....	....	4,273.47
21,330.40	20,492.01	20,219.60	14,061.66	142,033.62
20,816.27	19,514.73	17,126.43	15,362.58	108,739.22
22,454.30	26,164.44	18,745.12	21,479.43	134,655.52
24,312.26	18,565.05	20,061.02	23,496.22	162,411.88
17,573.90	17,162.10	14,973.80	3,520.84	85,239.63
7,058.73	9,785.86	7,178.01	....	25,639.97
97,031.00	**157,555.86**	**206,486.22**	**150,422.24**	**659,584.25**
97,031.00	155,430.38	193,560.95	131,787.27	625,898.53
....	2,125.48	12,925.27	18,634.97	33,685.72

the mainland of South America, are considered West Indian colonies.

TABLE 2: *Expenditures of the International Health Board for the*

Activity, State, and Country	July 1, 1913 Dec. 31, 1914	1915	1916	1917
Relief and Control of Hookworm Disease *Continued*				
The East:	$19,466.66	$37,253.19	$77,260.77	$84,912.45
Uncinariasis Commission to Orient	....	15,504.31	19,406.36	16,572.64
Australia	....	....	....	....
British North Borneo	....	....	....	....
British Solomon Islands (survey)	....	....	....	....
Ceylon	....	2,073.07	21,585.84	30,340.00
China	....	....	....	3,981.58
Egypt	19,466.66	6,608.12	....	....
Fiji	....	....	3,386.37	5,776.92
Java (survey)	....	....	327.66	....
India (survey)	....	....	....	....
Mauritius (survey)	....	....	....	....
Papua and Queensland	....	....	....	4,074.84
Seychelles Islands	....	589.06	3,933.29	7,409.69
Siam	....	....	6,147.52	6,458.57
Administration	....	12,478.63	22,473.73	10,298.21
Miscellaneous:	15,476.21	....	....	2,073.40
Research in Life History of Hookworm Eggs and Larvae	....	....	....	....
Study of Methods of Diagnosing Hookworm Disease	....	....	....	....
Conferences, Health Officers of Southern States	....	....	....	2,073.40
Motion Picture Film on Hookworm Disease	....	....	....	....
Lecture Charts	....	....	....	....
Salvador, Portable House and Office	....	....	....	....
Salvador, Loss from Earthquake	....	....	....	....
Thymol	15,476.21	....	....	....
Dutch Guiana, Care and Storage of Motor Boat and Supplies	....	....	....	....

Years 1913–1914 to 1921, Inclusive, Covering All Activities—Cont'd

1918	1919	1920	1921	Total
$97,932.47	$80,014.39	$113,472.55	$121,805.46	$632,117.94
....	....	....	....	51,483.31
....	15,902.95	35,417.41	39,912.29	91,232.65
....	....	3,106.23	7,440.10	10,546.33
....	....	....	1,378.85	1,378.85
36,041.44	32,497.87	33,779.28	23,689.34	180,006.84
12,400.87	12,187.58	....	....	28,570.03
....	....	....	....	26,074.78
5,579.84	....	....	498.64	15,241.77
....	....	....	....	327.66
....	....	7,810.00	12,496.30	20,306.30
....	....	5,688.56	....	5,688.56
18,633.50	....	....	....	22,708.34
8,089.06	8,291.90	4,643.03	....	32,956.03
13,042.15	7,514.66	15,850.03	18,429.18	67,442.11
4,145.61	3,619.43	7,178.01	17,960.76	78,154.38
4,359.97	520.14	5,381.44	6,066.57	33,877.73
....	....	....	3,618.83	3,618.83
....	43.95	....	500.00	543.95
2,990.76	....	2,488.71	....	7,552.87
....	....	2,817.73	1,584.74	4,402.47
17.40	....	....	....	17.40
945.35	476.19	75.00	....	1,496.54
406.46	....	....	....	406.46
....	....	....	....	15,476.21
....	....	....	363.00	363.00

TABLE 2: *Expenditures of the International Health Board for the*

Activity, State, and Country	July 1, 1913 Dec. 31, 1914	1915	1916	1917
County Health Work[1]	$........	$........	$........	$182.95
Alabama	....	....	....	....
Florida	....	....	....	....
Georgia	....	....	....	....
Kansas	....	....	....	....
Kentucky	....	....	....	....
Louisiana	....	....	....	....
Maryland	....	....	....	182.95
Mississippi	....	....	....	....
Missouri	....	....	....	....
New Mexico	....	....	....	....
North Carolina	....	....	....	....
South Carolina	....	....	....	....
Tennessee	....	....	....	....
Texas	....	....	....	....
Virginia	....	....	....	....
West Virginia	....	....	....	....
Administration	....	....	....	....
Malaria Control	....	....	54,496.97	39,978.58
Southern States:				
Alabama	....	....	....	....
Arkansas	....	....	11,104.58	4,276.23
Georgia	....	....	....	....
Louisiana	....	....	....	....
Mississippi	....	....	43,392.39	35,702.35
Missouri	....	....	....	....
North Carolina	....	....	....	....
South Carolina	....	....	....	....
Tennessee	....	....	....	....
Texas	....	....	....	....
Virginia	....	....	....	....
Administration	....	....	....	....
Foreign Countries:				
Ecuador	....	....	....	....
Argentina	....	....	....	....
Brazil	....	....	....	....
Nicaragua	....	....	....	....
Porto Rico	....	....	....	....
Miscellaneous:				
Conference of Malaria Workers	....	....	....	....

[1] In September, 1917, the hookworm work in the Southern States began to be absorbed in the being longer in some states than in others, it was not possible to announce until the end of 1920 regular functions, responsibility for all efforts directed toward the relief and control of hookworm

Years 1913–1914 to 1921, Inclusive, Covering All Activities—Cont'd

1918	1919	1920	1921	Total
$2,494.53	**$2,439.25**	**$8,182.77**	**$167,765.19**	**$181,064.69**
....	....	....	18,231.35	18,231.35
....	....	....	237.75	237.75
....	....	....	4,338.17	4,338.17
....	....	4,494.00	6,316.99	10,810.99
....	....	......	16,316.41	16,316.41
....	....	....	5,618.28	5,618.28
2,494.53	2,264.25	....	1,762.59	6,704.32
....	....	....	15,652.72	15,652.72
....	....	....	600.00	600.00
....	....	957.04	10,837.52	11,794.56
....	....	....	14,413.38	14,413.38
....	....	....	17,651.97	17,651.97
....	....	....	14,686.42	14,686.42
....	....	....	12,765.65	12,765.64
....	....	....	13,972.74	13,972.74
....	175.00	2,731.73	4,164.56	7,071.29
....	....	....	10,198.70	10,198.70
26,489.29	**34,965.08**	**133,929.02**	**150,551.39**	**440,410.33**
....	....	8,906.92	7,650.06	16,556.98
4,749.02	13,505.66	7,048.90	4,777.15	45,461.54
....	....	1,230.86	....	1,230.86
....	....	30,699.94	22,929.88	53,629.82
21,740.27	21,167.37	27,537.43	21,185.61	170,725.42
....	....	....	1,471.37	1,471.37
....	....	7,526.13	18,676.30	26,202.43
....	....	13,942.74	13,321.90	27,264.64
....	....	1,969.94	1,512.56	3,482.50
....	....	11,472.34	10,347.23	21,819.57
....	....	5,284.84	831.65	6,116.49
....	....	6,032.20	10,198.68	16,230.88
....	....	4,595.59	....	4,595.59
....	....	....	5,661.02	5,661.02
....	292.05	....	....	292.05
....	....	425.66	6,662.51	7,088.17
....	....	5,445.18	24,914.84	30,360.02
....	....	1,810.35	245.00	2,055.35

programs of the rapidly developing county departments of health. The period of transition that in all the states the county health departments would henceforth assume as one of their and other soil-borne diseases.

TABLE 2: *Expenditures of the International Health Board for the*

Activity, State, and Country	July 1, 1913 Dec. 31, 1914	1915	1916	1917
Malaria Control—*Continued*				
Miscellaneous—*Cont'd*				
Study of Source of Blood Meals of Anopheles Mosquitoes..	$........	$........	$........	$........
Yellow Fever Control	....	....	41,863.17	9,344.03
Yellow Fever Commission..........	....	....	41,863.17	7,727.74
East Coast of Brazil and Caribbean...	....	....	....	1,616.29
Brazil............	....	....	....	....
Ecuador..........	....	....	....	....
Guatemala........	....	....	....	....
Mexico and Central America........	....	....	....	....
Peru............	....	....	....	....
Salvador..........	....	....	....	....
Epidemic Work....	....	....	....	....
Tuberculosis in France............	....	....	....	51,856.24
Inauguration of Work..........	....	....	....	18,671.74
Department of Organization.......	....	....	....	....
Public Health Division............	....	....	....	....
Central Administration...........	....	....	....	18,292.10
Educational Division...........	....	....	....	5,316.39
Medical Division...	....	....	....	9,576.01
Contingent Fund...	....	....	....	....
Public Health Education...........	....	....	9,256.74	12,376.63
Department of Hygiene, São Paulo .	....	....	....	179.59
Institute of Hygiene, Czechoslovakia...	....	....	....	....
Public Health Institutes.........	....	....	....	....
Fellowships........	....	....	....	971.85
Adviser in Medical Education.......	....	....	....	11,225.19

Years 1913–1914 to 1921, Inclusive, Covering All Activities—Cont'd

1918	1919	1920	1921	Total
$........	$........	$........	$165.63	$165.63
46,639.17	94,526.42	139,757.40	239,057.53	571,187.72
....	44,271.12	83,717.13	....	177,579.16
2,897.97	....	....	....	4,514.26
....	....	....	461.30	461.30
29,473.98	48,396.77	28,574.98	1,698.06	108,143.79
14,267.22	967.82	....	....	15,235.04
....	....	....	156,562.54	156,562.54
....	....	....	80,335.63	80,335.63
....	890.71	3,926.26	....	4,816.97
....	....	23,539.03	....	23,539.03
433,030.43	602,775.78	518,013.51	359,540.31	1,965,216.27
....	....	....	....	18,671.74
....	....	139,364.76	47,281.28	186,646.04
....	....	76,191.46	101,473.08	177,664.54
80,037.65	72,394.12	86,310.57	89,575.04	346,609.48
85,755.19	141,053.34	135,920.64	79,839.90	447,885.46
267,237.59	389,328.32	80,226.08	40,621.01	786,989.01
....	....	....	750.00	750.00
36,642.82	38,367.71	68,373.54	89,094.44	254,111.88
32,788.84	23,582.57	29,929.01	24,727.16	111,207.17
....	....	....	204.51	204.51
....	....	....	3,466.64	3,466.64
2,353.98	13,118.47	38,409.84	60,696.13	115,550.27
1,500.00	1,666.67	....	....	14,391.86

TABLE 2: *Expenditures of the International Health Board for the*

Activity, State, and Country	July 1, 1913 Dec. 31, 1914	1915	1916	1917
Public Health Education—*Continued*				
Medical Commission to Brazil[2]	$........	$........	$9,256.74	$........
Study of Teaching of Hygiene and Public Health in Medical Schools	....	....	....	....
Public Health Laboratory Service	....	....	....	....
United States:				
Kansas	....	....	....	....
Foreign:				
Guatemala	....	....	....	....
Nicaragua	....	....	....	....
Salvador	....	....	....	....
Administration	....	....	....	....
Miscellaneous	15,138.35	15,057.65	27,628.35	18,191.76
Czechoslovakia Public Health Work	....	....	....	....
Paris Conference on International Nomenclature of Causes of Death	....	....	....	....
Compilation of Mining Sanitary Code	....	....	....	....
Survey Public Health Administration in Massachusetts	....	....	....	....
Investigation of Powdered Milk	....	....	....	....
Medical Commission to Brazil[2]	....	....	9,256.73	....
Visit of Brazilian Scientists to United States	....	....	....	....
British Advisory Committee	2,561.36	....	....	....
Field Equipment and Supplies	742.88	....	....	2,464.68
Surveys and Exhibits	11,421.16	15,057.65	18,371.62	13,854.57
Pamphlets and Charts	847.86	....	....	1,335.66
Library	1,844.12	....	....	....
Express, Freight, and Exchange	....	....	....	536.85
Refunds which could not be credited direct to budget	−(2,279.03)	....	....	....

...nts one half total expenditure.

Years 1913–1914 to 1921, Inclusive, Covering All Activities—Cont'd

1918	1919	1920	1921	Total
$........	$........	$........	$........	$9,256.74
....	....	34.69	....	34.69
....	....	....	16,109.70	16,109.70
....	....	....	2,539.88	2,539.88
....	....	....	307.50	307.50
....	....	....	85.18	85.18
....	....	....	984.34	984.34
....	....	....	12,192.80	12,192.80
23,034.17	46,901.63	51,248.30	59,652.90	256,853.11
....	....	12,708.81	20,736.31	33,445.12
....	....	615.30	....	615.30
....	....	....	125.98	125.98
....	26.09	1,467.27	....	1,493.36
....	....	500.00	....	500.00
....	....	....	....	9,256.73
....	....	....	7,660.12	7,660.12
....	....	....	....	2,561.36
3,000.00	23,434.94	5,996.96	4,982.25	40,621.71
14,970.85	16,870.71	23,528.78	13,437.76	127,513.10
3,999.49	5,499.50	5,873.33	10,153.44	27,709.28
....	....	....	....	1,844.12
1,063.83	1,070.39	557.85	2,557.04	5,785.96
....	....	....	....	−(2,279.03)

CHINA MEDICAL BOARD

Report of the Director

To the President of the Rockefeller Foundation:

Sir:

I have the honor to submit herewith my report as Director of the China Medical Board for the period of January 1, 1921, to December 31, 1921.

Respectfully yours,

ROGER S. GREENE,

Director.

CHINA MEDICAL BOARD

The year 1921, the seventh of the Board's work in China, was marked by the completion of the main buildings of the Peking Union Medical College and the occupation of the hospital and medical school by a nearly complete staff in all the major departments, with three classes under instruction in the medical school proper. This is the only institution for which the China Medical Board has thus far assumed complete financial responsibility. It is hoped that it may serve as a model for other medical schools, not in the sense that it necessarily represents the ideal in all matters of organization and construction, nor that it is as yet complete in every respect as a few of the largest institutions in other countries may be said to be complete, but that it presents, in China, a demonstration more nearly adequate than any that has preceded it, of the essential elements of a modern medical school.

The College seeks to point the way by which the future system of Chinese medical education may be adapted as well as possible to the actual conditions in the country. If the hopes of its founders are realized, it will graduate a select group of leaders in medical education, in research,

and in public health administration, and a larger number of useful practitioners of medicine and surgery. In addition it will offer to men and women who have graduated from other schools, further training and experience to fit them for posts of greater responsibility in Peking or elsewhere. Organizations engaged in the great work of medical education in China may be interested in watching the progress of the school, and in observing, with profit to themselves, those features of its work which experience shows to have been wisely or unwisely adopted.

In general the other activities of the Board were of much the same nature as in previous years. Aid was continued toward the current expenses of three medical schools wholly or partly under mission control, and a new departure was made in a grant to one purely Chinese school of funds with which to purchase a site for a contemplated new plant. In the field of premedical education, contributions were continued to four colleges, and plans were prepared for some extension of this work so that the supply of prospective medical students might be increased and the medical schools be relieved of the necessity of maintaining preparatory departments of their own.

A few new appropriations were made to mission hospitals to make possible necessary im-

provements in staff and equipment, but the experience of the past few years seems to indicate that the most effective way to aid the hospitals is to improve and extend the facilities in China for the training of doctors, nurses, and technical workers of various kinds who cannot now be found in adequate numbers, in China or abroad, even when the funds for their support are available. It is therefore likely that in aiding individual hospitals in future, chief consideration will be given to those strategically located institutions which can be made to play an important part in the educational program by providing for the post-graduate training of doctors and by maintaining schools for nurses. In such centers there are large possibilities for local support once the professional work is placed on a high level, especially when properly qualified Chinese can be found to share both in the professional work and in the administrative control of the hospital.

Contributions were made to both Chinese and foreign medical associations for the support of the important work which they are doing in the preparation of a unified medical terminology in co-operation with other learned bodies, and in the translation of medical literature; and, finally, the system of fellowships and scholarships for doctors and nurses, both Chinese and foreign, was continued. But with the opening, to graduate

students, of the Peking Union Medical College, a larger proportion of the appointments were for work at Peking than abroad. Hereafter, the fellowships for Chinese will be assigned mainly to the Peking School, only the more advanced graduate students who have shown special promise in actual work in China being sent abroad. Foreign physicians also will be welcomed as graduate students at Peking, and it is hoped that they will make constantly larger use of the facilities there; but, since they have more leisure for study during their periodical furloughs in Europe and America, it is probable that provision will continue to be made for a limited number of fellowships and other grants in aid of their study abroad.

The results obtained from the fellowships have been very gratifying. Nearly all the Chinese medical students aided are now usefully employed in their own country, most of them in connection with medical schools, a few in government service, and some in hospitals, Chinese or foreign. So far as is known, only one is engaged exclusively in private practice, and nearly all are giving their time wholly to institutional work.

Looking back over the past ten years, it is clear that medicine in China has made real progress. The increased effectiveness of medical schools and hospitals, the development of an active

Chinese medical association under enlightened leadership, and the growing interest of the Chinese people in Western medicine and public health, are sources of satisfaction to those who hope to see the Chinese people in possession of a scientific, well-rounded, and complete system of medicine.

I. MEDICAL EDUCATION

A. The Peking Union Medical College

In the promotion of modern medicine in a new field such as China, the matter of personnel is naturally the most important factor, for when the need is recognized and qualified doctors and nurses are available, the means can eventually be found to maintain them and to secure the physical equipment which they need to make their work productive. It is obvious that foreigners can play only a very limited part so far as giving actual medical service is concerned; while foreign-trained Chinese doctors and nurses, though they can be very useful in the initial stages, will always be few in number and at some disadvantage because the schools they have attended have not sought to equip them for meeting the special conditions, whether of climate or of social and economic organization, which prevail in China. Therefore the establishment of an institution to provide the requisite training on local soil was logically the first step in the program of the China Medical Board. The efforts of its officers during these first years have accordingly been largely devoted to the reorganization and equipment, on a satisfactory basis, of one such

medical school, the Peking Union Medical College.

The College was fortunate in securing among the first members of the new board of trustees which was organized in 1916, Dr. William H. Welch, of Johns Hopkins University, and Dr. Simon Flexner, director of the laboratories of the Rockefeller Institute for Medical Research. Experience in the conduct of medical and general educational work in China has been contributed by representatives of the six British and American missionary societies which had maintained the old Union Medical College from which the new institution has been developed. All of the thirteen trustees have spent some time in China and have first-hand knowledge of the problems to be met.

Since 1915 the College has been supported by annual contributions from the China Medical Board. The budget for the academic year 1921–1922 provides for a gross expenditure, on the school and hospital, of $1,418,989 Chinese silver currency. The local income from fees and hospital earnings is estimated at $219,383 Chinese currency. To cover the difference an appropriation of $600,000 United States currency has been provided.

The finding of a qualified staff and the organization of the medical and pre-medical schools

and the hospital was entrusted to Dr. Franklin C. McLean, the professor of medicine and the first Director of the College. Dr. McLean having resigned the directorship in 1920 to devote himself entirely to the department of medicine, Dr. Henry S. Houghton, formerly dean of the Harvard Medical School of China, was elected to succeed him and was formally inaugurated in September, 1921. No teaching responsibilities are now attached to the directorship, since it has become evident that the administrative duties of the post are so heavy as to require the full time of the director.

Dr. Houghton has been associated with the China Medical Board for the past six years, and has served as acting Director of the Board at New York and as acting Resident Director in China. During the period of construction he had charge of all the work of the school in Peking. Dr. Richard M. Pearce, Director of the Division of Medical Education of the Rockefeller Foundation, was in residence in Peking during the year 1921–1922 in an advisory capacity. In the absence of Dr. Houghton on a short visit to the United States Dr. Pearce acted as Director.

Acknowledgments are due to members of the faculties of many of the best American and British medical schools for assistance given in finding teachers, and in affording, to persons selected for

Fig. 73.—Graduates and students, 1921, Training School for Nurses, Peking Union Medical College

Fig. 74.—Medical-ward building and pathology building, Peking Union Medical College

the staff, opportunities for additional preparation in laboratories and clinics.

The staff of the medical school proper at the end of the year 1921 consisted of seven professors, six associate professors, one assistant professor, and seventeen associates, besides fifteen assistants in all departments. In the pre-medical school there were four assistant professors, five instructors, and seven assistants. Of this teaching staff, forty-seven were Americans or Europeans and forty-three were Chinese, the latter being for the most part men who had studied either in the United States or Great Britain. The higher administrative staff consists of the Director, the superintendent of the hospital, the comptroller, and forty-seven other administrative and technical employes, of whom forty-four are Europeans or Americans and three Chinese. The nursing department of the hospital and the nurse training school include twenty-six European or American nurses and five Chinese graduate nurses trained in the United States. All the regular teaching staff are now on the full-time basis, but this policy may be modified as the number of Chinese physicians and surgeons in Peking who would be qualified to assist in the teaching increases.

In order to lessen the isolation of the staff from scientific progress in the West, provision has been

made for visiting professorships under which, every year, one or two leading medical scientists of the United States or Europe are invited to spend from four months to a year at Peking. In 1921 such visiting professorships were held by Dr. A. B. Macallum of McGill University, in physiology, and by Dr. Francis W. Peabody of Harvard University, in medicine. Dr. R. B. Seem, the superintendent of the new hospital for the University of Chicago, has served for a year as superintendent, aiding in the organization of the hospital. The friendly interest of such men, continued even after their return home, has been of great value to the College.

In recent years the number of foreign travelers visiting Peking has much increased, and among them are occasionally men of scientific eminence whose visits have proved very stimulating. More systematic opportunity for renewal of contact with scientific activities at home is afforded by provision for a year's leave of absence, after four years of service, to all members of the medical faculty who continue with the College, full salary and traveling expenses for the round trip being paid. It is hoped to insure to all members of the scientific staff opportunities for private study and research in addition to their teaching and clinical duties.

During these earlier years problems of organi-

zation and the difficulty of finding and training the necessary assistants have naturally absorbed much of the energies of the staff, but in spite of these handicaps a creditable amount of work has already been done. China offers a particularly attractive field for study in many branches of medical science. A beginning is already being made in some promising anthropological studies, and, with the co-operation of numerous individuals and institutions throughout the country, an embryological collection has been started which should furnish the material for some very interesting research. A systematic survey has been begun of the human and animal parasites of China, and there is opportunity for the study of many tropical diseases which are rarely if ever encountered in the West. The full time of one chemist is being devoted to the investigation of Chinese foods, with a view to preparing as soon as possible the best hospital diets for various conditions. At the end of the year the services of this chemist were lent for a short time to the Philippine government for the study of diets for its leper colonies. There has just been assembled the first volume of *Contributions from the Peking Union Medical College, Peking, China*, containing the work published in 1921. A list of these papers is appended to this report (see page 308).

The requirements for admission to the medical

school are equivalent to those of institutions in the United States prescribing two years of college work in physics, chemistry, and biology after completion of the high school course, but as the high schools in China are still defective, and since it is necessary to give the students a good command of the English language, in which all the medical teaching is done, it has been thought best to extend the preparatory course in these subjects over three years. The first class was admitted to the medical school proper in the autumn of 1919, when the anatomy building was finished, and there were at the end of 1921 three classes under instruction, numbering altogether twenty-two students, eleven in the first year, six in the second, and five in the third. Women are admitted on the same terms as men, but only one woman had been enrolled in the medical school up to that time, though there were several women among the fifty-two students in the pre-medical school. Co-education has thus far involved no difficulties either with the students or the public. Growing recognition of the importance of higher education for women and the lack of money to maintain separate schools for them have led many other institutions to adopt the same policy, the very novelty of which has been an attraction in the present state of Chinese educational thought.

The smallness of the classes during the period of organization has been a real advantage both to the staff and to the students. It has been due in part to the fact that the character of the opportunities offered was not widely known, and partly to the fact that the entrance requirements were considerably higher than those of other schools. The faculty report that the students compare favorably with those in good medical schools in the United States. Their command of English is excellent, and they also have some reading knowledge of either French or German. At present the staff and equipment are planned for a maximum of twenty-five students in each undergraduate class, and it is expected that this limit will be reached in about five years. The course covers four years of formal instruction, with a fifth year of service, as hospital intern or as laboratory assistant, required for the degree. At present the College holds a provisional charter from the Regents of the University of the State of New York, and that body will confer the degrees until an absolute charter has been granted.

Much importance is attached also to graduate teaching, through which it is hoped that the College will be able to contribute directly to the raising of standards in other schools and hospitals. Already a few men with such special training received at the Peking Union Medical College have

been called to positions of greater responsibility in other institutions. For such students special fellowships are provided, which are assigned both to promising Chinese doctors and to foreign medical missionaries. In 1921 there were nineteen Chinese and seventeen foreign doctors holding these fellowships for varying periods of time, some coming for short intensive courses in ophthalmology and roentgenology and others remaining for several months of work in the clinics and laboratories. The average length of stay was three months in the case of foreign doctors and two months in the case of Chinese, but many of the latter had begun their residence shortly before the close of the year, so that these figures do not represent the actual length of the period of study planned. The total number of graduate and special students in residence at the close of 1921, including junior hospital staff and assistants in the laboratories, was seventy-five, of whom fifty-six were Chinese and nineteen foreigners. The school and hospital are therefore in more active use for educational purposes than the small number of undergraduate students would indicate. For the year 1922 special graduate courses in ophthalmology, general medicine, neurology, orthopedic surgery, and roentgenology have been announced. During the summer of 1921 the parasitologist of the school

conducted a well-attended summer course for doctors at Kuling, a resort in the Yangtze valley.

The College has a physical plant somewhat smaller than those of the leading medical schools of the West, but it has the great advantages possessed by too few schools in the United States not only of complete control of its hospital but also of close contact between the clinical and preclinical departments, which are all housed on one site with the buildings connected by corridors. Thus the plan of the buildings recognizes the accepted fact that the hospital is actually as much a teaching laboratory as are the laboratories of anatomy or physiology. The school is conveniently situated in the southeast quarter of the Tartar city on a short street known as San Tiao Hutung.

The exteriors of the new buildings have been planned to harmonize with the great architectural monuments of Peking so far as was permitted by the modern uses to which they were to be put. The green-tiled roofs of Chinese design, with highly decorated eaves; the porticoes with their red columns; and the marble terraces about the school and hospital courts, are modeled after the palaces and temples of Peking. In the case of the auditorium building it has been possible to adhere fairly closely to the classical Chinese designs. This attempt to use the beautiful

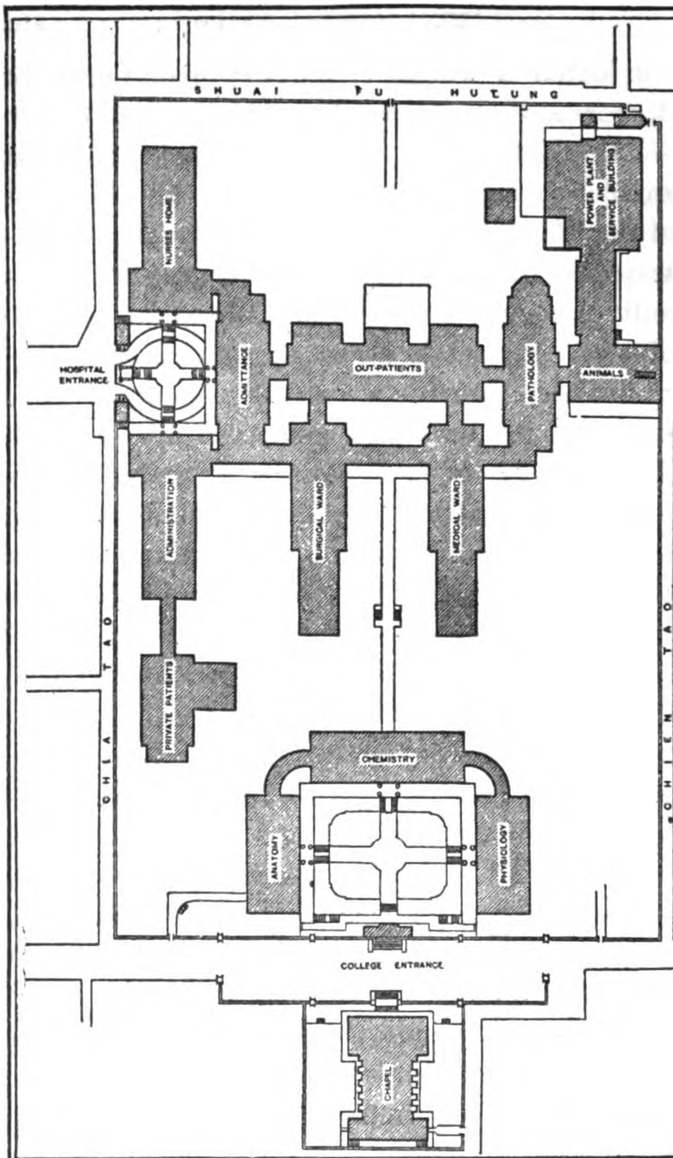
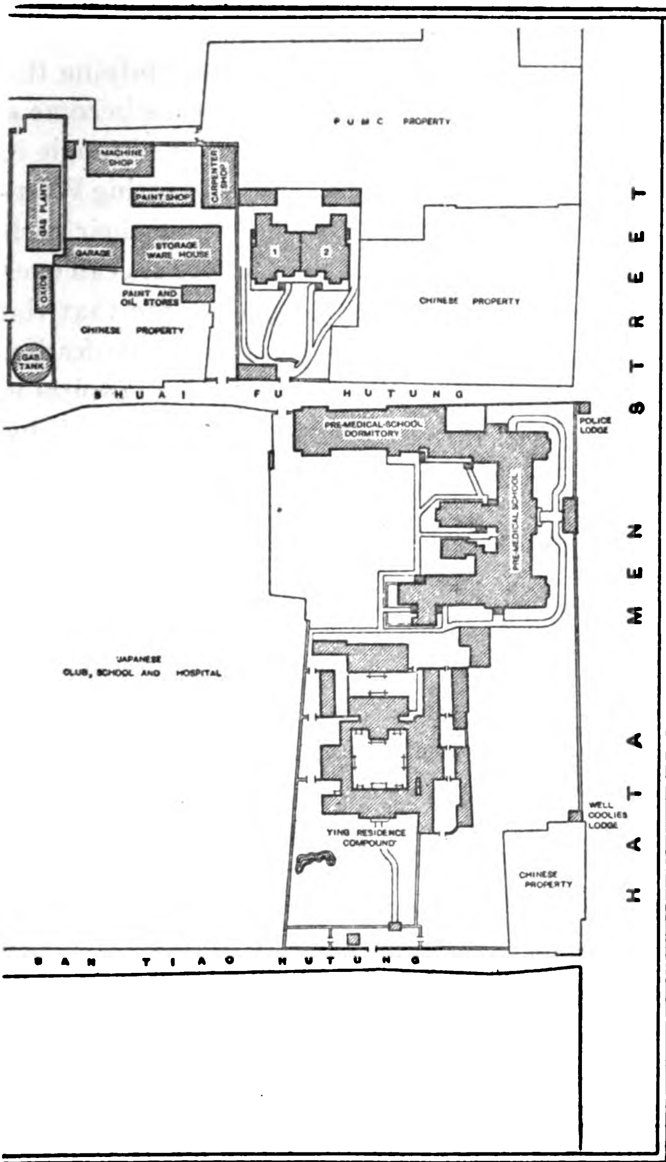


Fig. 75.—General plan of Peking Union Medical College, school buildings



showing location of college, hospital, and pre-medical

Chinese forms may be regarded as typifying the hope that the school itself may in time become a truly Chinese institution, and that through it Chinese scientists may succeed in adapting Western medical science to the needs of their own country more effectively than foreigners can ever hope to do. It is perhaps appropriate that the dignity of the once-despised medical profession and of the common people whom the hospital is intended to serve, should be symbolized by the adaptation of palace architecture to their uses.

The laboratories of anatomy, physiological chemistry, physiology, and pharmacology are in three buildings forming a court entered directly from the street. The department of anatomy occupies a two-story building forming the west side of the court and containing on the ground floor a lecture room seating fifty persons, a small museum, offices, and private laboratories. On the second floor are the dissecting room, a large students' laboratory for microscopic anatomy, and smaller rooms for individual workers and technicians. The basement contains a large refrigerator room for storage of cadavers, tanks, preparation rooms, animal room, dark room, shop, and storerooms. More storage space is provided in the attic. The physiology building on the west side is of the same size, the ground

floor containing the students' laboratory for pharmacology, a lecture room, and the necessary offices, small laboratories, and service rooms for this department. The second floor is given up to physiology offices and laboratories, including an operating suite. In the basement are a small machine shop, rooms for animals, storerooms, and a workshop with dark room for the X-ray department.

A three-story building on the north side of the court has on the ground floor the administrative offices of the College, and the library and reading rooms. The second floor contains the laboratories and lecture room for physiological chemistry, a centrifuge room, and a small operating room. The third floor, which is intended for the future expansion of the chemical laboratories, is now used as a dormitory for male nurses. The basement contains part of the library stacks and storerooms. Opposite the main school court is located an auditorium with students' reading rooms and social rooms attached, which is the headquarters of the department of religious and social work. The main hall is used for chapel exercises, popular lectures, and entertainments of various sorts.

North of the laboratory group and connected with it by a long corridor, under which runs a tunnel carrying the water, steam, electrical,

compressed air, and brine lines, is the hospital group, with which is connected the pathology building. The hospital has an entrance of its own from the west, with a smaller court having the nurses' home on the north and the hospital administration building on the south, with offices on the ground floor and in the basement, and house officers' quarters on the second floor. In the basement are also the mechanotherapy and hydrotherapy suites. A three-story building facing the gate contains, on the ground floor, part of the outpatient department through which all public-ward patients enter the hospital. The upper floors are given up to gynecological and obstetrical wards and a small ward for children. In the basement are bathrooms for newly admitted patients, emergency operating and dressing rooms, and observation wards.

Back of this building, and connected with it on three floors, is a large four-story building, facing south, the first floor of which contains the consultation and treatment rooms for general medicine and surgery, of the outpatient department. Connected with it in the basement are the eye and ear, nose, and throat clinics. On the second floor there is a large X-ray suite, the clinical laboratories of the department of medicine, the laboratory of the department of otolaryngology, a clinical lecture room, and two small classrooms.

Fig. 76.—A part of the academic procession at the dedication of the Peking Union Medical College, September 19, 1921

Fig. 77.—Graduate students attending summer course in roentgenology at Peking Union Medical College in 1921

Fig. 78.—Entrance court, from anatomy and physiological chemistry buildings, Peking Union Medical College

The third floor contains the offices and research laboratories of the departments of medicine, surgery, obstetrics, and ophthalmology. On the fourth floor are the surgical operating rooms, four in number, with the necessary auxiliary rooms and a small suite for dental work. The main hospital kitchens and dining rooms are in the basement.

Extending south from this dispensary and laboratory building are the two main public-ward buildings, that for medicine to the east and the surgical building to the west. Each block has three floors accommodating twenty-five patients on a floor, the standard unit consisting of one 16-bed ward, one 6-bed room, and three single rooms, with diet kitchen, dining room, linen closet, utility and bathrooms. The basements of these buildings provide convenient space for storage and workrooms of different kinds. Private patients are accommodated in a separate pavilion south of the administration building. There are accommodations here for twenty patients on two floors, and one floor is reserved for quarters for women members of the house staff. In the basement are the kitchens for the preparation of European food, and the staff dining rooms. The total capacity of the hospital is 250 beds, but on account of the small number of students and the necessity of building

up the organization slowly, only about 150 beds have been in use thus far.

The department of pathology is in a three-story building connecting on all floors with the medical clinic and laboratories. In the basement are the autopsy and lecture rooms, the morgue, glass-washing room, and storage space. A one-story animal house adjoins it. On the first floor are the laboratories of public health and parasitology, a small museum, the central pathological laboratory for all departments of the hospital, and a large students' laboratory for pathological histology. The second floor contains the offices and private laboratories of the professor of pathology and the associate professor of bacteriology, the students' bacteriological laboratory, and the media room. On the third floor are laboratories intended eventually for pathological chemistry but now used for an investigation of Chinese foods, and the illustration service, including photographic rooms. A part of this floor is cut off for emergency isolation wards for the hospital.

A one-story building opening on the service court in the northeastern corner of the lot contains the receiving rooms for supplies of all kinds for the hospital and medical school, and the large bedding sterilizer. This connects with the power house, in which are located the electric generators, air compressors, pumps for the hot and cold

Fig. 79.—Electrocardiograph room in hospital, Peking Union Medical College

Fig. 80.—An operating room in hospital, Peking Union Medical College

Fig. 81.—Laboratory of physiological chemistry, Peking Union Medical College

Fig. 82.—Dissecting room, anatomy building, Peking Union Medical College

water, refrigeration plant, et cetera. The buildings are all heated in winter by exhaust steam from the engines. All the water used is pumped from deep wells driven on the college property, as the supply from the municipal water-works is inadequate and extremely expensive. Above the engine room is the laundry equipped with American machinery, and above that are two floors of servants' rooms. As the city of Peking has no public gas plant, and since modern mechanical industries have been little developed there, it has been necessary for the College to develop a small industrial area of its own across a narrow street from the main buildings. Here are located a small gas plant; the main garage; woodworking, metal, and paint shops; a precision shop; and a large storehouse to contain the reserve supplies of all sorts, of which it is necessary to carry a large stock on account of the remoteness of Peking from the markets of the world.

The pre-medical school and students' dormitories are in older buildings on detached property nearby. The College also possesses thirty-six residences for members of the staff, thirty-one of which have been newly built with all modern conveniences. The building of these houses was made necessary by the shortage of residences suitable for use by foreigners. Thus the whole

physical plant is inevitably much larger and more complicated than would be necessary for a medical school of the same size in any large city of the Western world, and this fact adds much to the administrative difficulties and expense of conducting the institution.

It will be noted that the institution does not yet possess a special children's clinic nor institutes for mental and infectious diseases. Though children not suffering from infectious diseases can be received in the present hospital, the lack of suitable provision for the study of mental and infectious diseases is a serious defect that must eventually be remedied, perhaps by affiliation with institutions under Chinese control, of which none that are really satisfactory now exist. This solution would in many respects be the most desirable, as the maintenance of such hospitals, besides adding greatly to the expense, would involve some embarrassing administrative problems with which a foreign institution might find it difficult to deal. The prospects for such co-operation are encouraging. Already arrangements for the care of convalescent children have been made with a Chinese institution in the western hills near Peking; a project is on foot for an eye hospital with which the College department of ophthalmology would co-operate; and Dr. S. P. Chen, an able Chinese physician in

charge of the government isolation hospital, is assisting in the teaching of infectious diseases.

The buildings have been occupied gradually as they have been completed. When the new hospital was finally opened in July, 1921, the clinical work was transferred to it from the old hospital which had been used under the former organization. The attempt has been made to provide the faculty with all the mechanical equipment needed for the best possible work in the laboratories and wards. Electric current, including separate light and power and low-voltage lines, gas, medium-pressure steam, compressed air, hot and cold water, and refrigeration have as far as possible been supplied at all points where they were required. The wards and the physiological laboratory have permanent connections with the electrocardiograph in the medical laboratories, there are telephone connections throughout the buildings, and electric call-systems have been installed. Besides standard apparatus for teaching and clinical work, a considerable amount of special equipment for research laboratories has been provided.

A library has been collected containing some 22,000 volumes and 450 sets of the most important journals. Since no other large medical libraries exist in China, it has been necessary to make the collection more comprehensive than is

customary in a similar school in the United States, where access can be had to other libraries. There are still some serious gaps, as might be expected in a new library, but nevertheless a very useful working collection has already been formed.

Great importance is attached to the training school for nurses, conducted in the hospital. High-school graduation or its equivalent, and a working knowledge of English, are required for admission, and the regular course extends over four years, including one preparatory year, during which instruction is given in physics, chemistry, and biology in addition to the special subjects required for nurses. By special arrangement, Peking University offers a bachelor's degree to nurses taking a combined course in its arts college and the nurse training school of the Peking Union Medical College. Special classrooms and laboratories for this school are provided in the nurses' home. It is hoped that nurses trained here will be prepared to take positions of responsibility as teachers and supervisors in other schools and hospitals. In 1921 ten pupils were enrolled. Only women are now admitted to the school, but as the supply of female nurses and pupils is very small, a number of male nurses are still employed, under female supervisors, in the men's wards.

The formal opening exercises of the College and the inauguration of the new director, Dr. Henry S. Houghton, were held in Peking during the week extending from September 15 to 22, 1921. Advantage was then taken of the presence of a number of distinguished guests from all over the world to hold a series of scientific meetings and clinics. Meetings of the trustees were held at the same time, to discuss important matters of policy in the light of intimate contact with the staff and the current work of the school. Among the eminent scientists attending the exercises and taking part in the proceedings were:

Prof. T. Tuffier, Surgeon at the Hôpital de la Pitié, Paris.
Dr. A. B. Macallum, Professor of Biochemistry at McGill University, Montreal.
Sir William Cecil Smyly, Dublin.
Dr. R. T. Leiper, Director of the Department of Helminthology, London School of Tropical Medicine.
Dr. Francis W. Peabody, Associate Professor of Medicine, Harvard Medical School.
Dr. George E. de Schweinitz, Professor of Ophthalmology, University of Pennsylvania.
Dr. Florence Sabin, Professor of Histology, Johns Hopkins University.
Dr. S. S. Goldwater, Director of Mt. Sinai Hospital, New York City.
Dr. S. Hata, of the Kitasato Institute, Tokyo.
Professor Mataro Nagayo, of the Imperial University, Tokyo.
Professor K. Shiga, of Seoul, Korea.

Dr. Wu Lien-teh, of the North Manchurian Plague Prevention Service.

Dr. S. P. Chen, Medical Superintendent of the Government Isolation Hospital, Peking, and Medical Director of the Central Hospital.

Sir William Brunyate, K. C. M. G., Vice-Chancellor of the University of Hong Kong.

Dr. C. W. Wang, University of Hong Kong.

President Guy Potter Benton of the University of the Philippines.

Dr. F. G. Haughwout, Professor of Protozoology and Parasitology, University of the Philippines.

Dr. A. de Waart, Member of Commission on Medical Education, Dutch East Indies, Weltevreden, Java.

The Chinese Government was represented at the formal opening by the Ministers of Education, Foreign Affairs, and the Interior, who made addresses testifying to their appreciation of the purposes of the College and its founders. The Minister of Foreign Affairs paid high tribute also to the work of British and American medical missionaries in China.

On the part of the Chinese public there has been no lack of appreciation of the service rendered by the hospital, such difficulties as have arisen being due to the fact that so many patients have come for treatment that it has been necessary to limit the numbers in order not to interfere with the teaching and other duties of the staff. In general, foreign patients are received only when referred by their physicians.

These restrictions, though they have caused some misunderstanding, are unavoidable if the hospital is to fulfil its primary function as a teaching institution and give its best service to those whom it admits.

Members of the staff have frequently been called upon for public service in emergencies. In previous years they have aided in attending those wounded in civil war, and in combating plague and other epidemics. In 1921, members of the department of medicine assisted in organizing and administering the sanitary work connected with the relief of famine sufferers, and the director of religious and social service had charge of the recruiting of relief workers from all over the country. Diets for the famine sufferers were also planned in consultation with the food chemist of the college. It is evident, therefore, that the College is now a going concern, already making a contribution to the community which it may be hoped will become more significant as time goes on.

B. Aid to Other Medical Schools

While it has been necessary to provide one fully equipped and highly organized medical school to aid in setting standards for medical education in China, and to give opportunity for the training of teachers and investigators, it is

realized that the general progress of medicine must depend largely on institutions under other auspices throughout the country; and that in all probability many of the future leaders of the Chinese medical profession will be men who have secured their undergraduate training entirely in such schools. The Board has therefore been greatly interested in the development of medical schools other than that for which it has assumed complete responsibility, and has given some financial aid to those which seemed to offer the most promise of sound growth.

1. Hunan-Yale College of Medicine

In the past, foreign agencies of various kinds have made the greatest contributions to medical progress in China, the Chinese organizations having lacked either the experience or the assurance of continued financial support that are needed for maintaining high-grade medical schools and hospitals. Nevertheless, it is upon the Chinese themselves that the responsibility for progress must eventually rest, and they are already able to make an important contribution of their own, not only in forming and carrying out policies that will be adapted to Chinese conditions, but in securing funds.

In the present period of transition from foreign to Chinese leadership, it is fortunate that there

exists, in the Hunan-Yale College of Medicine at Changsha, an institution in which foreigners and Chinese are partners on equal terms. This school is controlled jointly by the Ruchun Educational Association, a society of Hunan gentlemen which receives a subsidy from the provincial government, and by the Yale Foreign Missionary Society. The dean is a Chinese graduate of Yale, who enjoys the full confidence of both foreigners and Chinese, and the staff is made up of Chinese and foreigners in practically equal numbers (six Chinese and seven foreigners). The greatest assets of this school are the interest of the Chinese community in which it is working, and the high educational ideals of its American supporters, resulting from close relations with a great American university. While its resources and staff have been very limited, this disadvantage has to a great extent been compensated by the enthusiasm of its teachers and students, and by the fact that the number of students has been so small that it has been possible to maintain more intimate contact between staff and students than is possible in a larger institution.

The first class of eleven men graduated in 1921, on completion of the five-year course, and in the fall term of that year there were forty-five students registered in the five classes of the medical school. There is probably no hospital in China

where the interns are doing better work than these first graduates are doing in the Hunan-Yale hospital. Instruction in this school, as at Peking, is given entirely in English, on account of the lack of sufficient medical literature in Chinese and the difficulty of securing qualified teachers who speak fluently the Chinese tongue. Much of the success of the school is due to the thorough preparation received by the pre-medical students at the College of Yale-in-China. Women students are now admitted on equal terms with men.

The physical plant consists of a fine 120-bed hospital given by a Yale graduate, a medical school building erected with Chinese funds, and a pre-medical laboratory contributed by the China Medical Board. Funds for an outpatient building to cost about $25,000 gold have been pledged by the Commonwealth Fund and the provincial government. The budget of the medical school and hospital for the year 1921–1922 amounted to $87,000 gold. The China Medical Board is making an annual contribution of $41,605 Mex. and $6,645 gold to the hospital and pre-medical department, of which about $7,000 is assigned to the College of Yale-in-China for work in physics, chemistry, and biology. For the 1921–1922 budget, about $15,000 gold will be available from a grant of the Commonwealth Fund. In normal

years the school receives from the provincial government $50,000 Mex. (about $25,000 gold) per annum.

The school has been seriously embarrassed financially during recent years, on account of the political disturbances in Hunan province, which have prevented the government from giving its usual support to educational work. The medical school has suffered with, but no more than, the government educational institutions of Hunan. While all praise must be given to the staff for the results accomplished under great difficulties, more support is urgently needed. The shortage of men has prevented the proper development of departmental organization, particularly for the pre-clinical sciences, which have been taught partly by men with heavy hospital duties. There is also need for more and better qualified assistants in nearly all departments, and for more supplies and equipment. It is to be hoped that generous aid will be forthcoming from the Chinese and foreign friends of the institution, for there are probably few schools in China where greater results may reasonably be expected from the expenditure of any given sum.

2. Shantung Christian University School of Medicine

The work of Christian missionary societies in giving medical aid to China deserves high praise.

Medical education under missionary auspices began in hospitals, where one or two men did all the teaching in addition to carrying the routine clinical and administrative work. While some useful assistants were thus trained it was clear that no permanently satisfactory results could be obtained by this method, and consequently there were organized, in several important centers, medical schools where a few men were set apart for teaching. Even in these schools the teachers were far too few, and very inadequate attention was given to the fundamental sciences. In 1914 there were thirteen such schools under mission auspices.

The Council on Medical Education of the China Medical Missionary Association early drew attention to the desirability of concentrating in a few places the meagre funds available for the maintenance of these schools, in order to insure the best results; and after the China Medical Board undertook to support in Peking a school teaching in English, the Council recommended that medical teaching in Chinese be concentrated so far as possible at the Shantung Christian University at Tsinan. As a result of the growing appreciation of the wisdom of this policy, which was made more evident by the increasing cost of medical work and the difficulty of securing men and money during the late war, as well as by the

Fig. 83.—Ward in Central Hospital, Peking. The hospital, organized and maintained by Chinese, has been aided by the Foundation

Fig. 84.—Nursing demonstration and practice room, Nurses' Home, Peking Union Medical College

Fig. 85.—Corridor connecting units of the hospital group, Peking Union Medical College

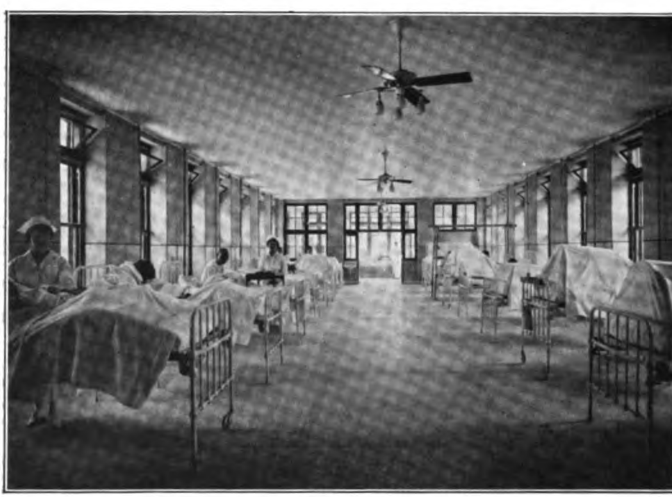


Fig. 86.—Surgical ward of hospital building, Peking Union Medical College

more general understanding of the requirements of modern medical science, there has been a marked decrease in the number of schools, six having been closed and no new ones having been opened. It is likely that plans now under discussion will result in still further reduction. At the same time the medical department of the Shantung Christian University, to which, originally, only two societies were contributing, is now officially supported by eight societies, and there are actually nine missionary organizations contributing to its maintenance.

In 1914 the total budget was estimated at only $20,000 Mex., and there were on the staff only five fully qualified medical teachers and one nurse. There was no administrative staff. In 1916 the China Medical Board made an appropriation of $50,000 to this school, for new buildings and equipment, and a total of $100,000 for maintenance for five years, on condition that the school should undertake the instruction of five classes of students previously enrolled at Peking. Additional appropriations were later made to cover the loss by exchange on these grants. This agreement came to an end in 1921, and a new appropriation of $33,000 Mex. was made for the maintenance of the school during the year 1921–1922, pending discussion regarding the future development of the institution. At the end of

the year 1921 the staff included twenty-one teachers and administrative officers who were either foreigners or Chinese who had studied abroad; there were four foreign nurses; and the locally trained staff had greatly increased in efficiency. The budget contemplated for 1922–1923 amounts to $143,180 Mex. for the school and hospital. This great increase in the total budget, when the contribution of the China Medical Board has been decreased from the equivalent of $40,000 to $33,000 Mex., is convincing evidence of the enterprise of those responsible for the school. A small annual grant is now made by the province.

The preparation of the students has been much improved by the arrival of new teachers of physics, chemistry, and biology, and excellent laboratories for these sciences have been provided in the new buildings of the university. The teaching in the medical school has been entirely reorganized. Men with special training in the pre-clinical sciences have been set free to devote themselves wholly to this fundamental work, and the clinical departments have also been strengthened. More attention has been devoted to the teaching of English, so that now the best students are able to use English books and journals and after graduation can continue their studies in institutions where the teaching is in that language. It is

proposed hereafter to admit women students to the school, and a plan is under consideration for uniting with this institution the medical school for women now at Peking.

Among the important activities of the school are the translation of medical textbooks into Chinese, and co-operation with government institutions and the National Medical Association in working out a Chinese medical terminology. A small journal in Chinese is also being published.

3. Medical Education at Shanghai

The organizations interested in medical education under mission auspices in the lower Yangtze region have been making plans for a union institution in that city, but no definite decision had been reached up to the close of the year. Meanwhile the Pennsylvania Medical School of St. John's University is continuing its work. The China Medical Board has been contributing to this school the salary of one man.

4. Co-operation with Chinese Institutions

The National Medical College at Peking, which is controlled by the Ministry of Education, is one of the most promising schools under purely Chinese control. This institution is contemplating the construction of a new plant. Last year an advantageous site became available, toward

the purchase of which the China Medical Board made a grant of $6,000. The old site having greatly increased in value on account of business development in its vicinity, the authorities propose to sell it and to apply the proceeds toward the erection of a modern school and hospital.

In general the government schools have suffered during recent years on account of the difficult political and financial conditions in the country, but several of their leading teachers have been sent abroad for further study in preparation for the development which is sure to follow any improvement in the present situation.

There are other important medical schools in China with which the China Medical Board has had no relations other than those of friendly intercourse. Of these the best organized are the South Manchuria Medical College at Mukden, which is supported by the South Manchuria Railway Company, and the former German Medical School at Shanghai, which is now supported largely with Chinese funds. The medical school of the University of Hong Kong, though outside of Chinese jurisdiction, is also making an important contribution to medical education in China. It will have wide influence in the regions to the south, particularly the British East Indies

and the Straits Settlements. The China Medical Board has contributed toward two scholarships in each class of this school for students from the Canton Christian College, the first to become available for the class of 1922.

II. PRE-MEDICAL EDUCATION

As the work of the China Medical Board has progressed, it has become evident that no general improvement in medical education could be expected until well-prepared students were available in much larger numbers than at present. Hitherto the main effort of the Board in the field of pre-medical education has been made in connection with the Peking Union Medical College, where the pre-medical school has served not only to prepare students for study at Peking, but also to set a standard for other institutions. In 1921 a few teaching fellows were admitted to the school in order that they might have the experience of teaching in a well-equipped school, under the guidance of experienced instructors, while at the same time carrying on studies of their own. It is hoped that these men will later become useful members of the faculties of other institutions.

At the meeting of the trustees of the College, at Peking in September, 1921, it was decided to look forward to the closing of the pre-medical school as soon as a sufficient number of properly prepared students could be secured from other colleges. As conditions now stand, considerable improvement must be made in the schools and

colleges of China before such action will be feasible. Mention has been made in the reports for previous years of grants in aid of the pre-medical work at St. John's University at Shanghai; the Hunan-Yale Medical College, Changsha; Ginling College for Women, Nanking; Fukien Christian University, Foochow; and Canton Christian College. Buildings have now been erected with these grants at Shanghai and Changsha, and additional teachers have been secured.

For several years the leading missionary societies have felt that it was necessary to have experts make a careful study of the whole field of Christian education in China with a view to increasing its effectiveness. Last year it became possible to secure an exceptionally well-qualified international commission to make this study. As it seemed to the China Medical Board that the work of the Commission was likely to add much to the effectiveness of its own medical program, a contribution of $8,000 was made toward the expenses of the undertaking. The investigations of the Commission were carried out in the fall of 1921, but its report has not yet been published. A special investigation of pre-medical education in Chinese and foreign colleges was also made for the Board in 1921 by Dr. Paul Monroe, of Teachers College, New York,

and by Dr. W. W. Stifler and Dr. S. D. Wilson, of the pre-medical school of the Peking Union Medical College. At about the same time leading Chinese educators, as a result of a preliminary survey made for them by Dr. Monroe, organized a National Educational Reform Association which is proposing to employ Chinese and foreign experts to suggest means of improving the strictly Chinese schools. Great improvements in general education may be expected as a result of these studies, and the medical schools will also profit from them.

III. OTHER ACTIVITIES

A. Aid to Hospitals

In practically all countries it is recognized that even those hospitals which are not connected with medical schools have important educational functions to perform. This is particularly true of the hospitals in China. Besides training interns and nurses they provide opportunities for the continued employment of young doctors who need the facilities of the hospital and the friendly guidance of more experienced men if they are to continue their professional growth. Local medical associations in China have been little developed; there are no medical libraries except in the schools; and outside of a few large cities there is no systematic provision for stimulating professional intercourse between practicing physicians. Association with a good hospital can do much to compensate for these disadvantages, and thus conserve for future usefulness the men turned out by the schools.

The hospital has also a useful part to play in the education of the public. In many cities the mission hospital is the only place where modern medicine is practiced, and the only center for popular health education. In time of epidemic,

famine, or civil war, it is to the hospital that the people and the officials look for medical and surgical aid and for advice as to preventive measures against disease. As a result of the work that these often-isolated institutions have done, there is, on the part of the people, a widespread confidence in Western medicine and a growing appreciation of the importance of public health measures, one indication of which is the popularity of the newly-coined word, *wei-sheng* ("life-protecting," or "sanitary"), which is now frequently seen even on the signs of laundries and barber-shops. In certain cities, the local authorities pay large annual subsidies to mission hospitals in recognition of their public service, and gifts for special purposes are common.

Since the China Medical Board began its work in 1915, grants have been made to mission hospitals to enable them to improve their work, through additions to plant and equipment or through increases of staff and maintenance appropriations. In 1921 payments were made to sixteen such institutions to the total amount of $123,985.89. It is the usual rule at present to contribute not more than one half of the amount required for the proposed improvements. In this way the interest of other friends of the hospital is stimulated and a broader foundation is laid for future development. New appropriations were

made last year to five institutions: the Methodist Hospital in Peking, for the development of its dental department; the American Board Hospital in Fenchow, Shansi, for the completion of its excellent new hospital and for more adequate maintenance; the Southern Baptist Hospital at Yangchow, Kiangsu, and the Canton Hospital, for maintenance; and the American Presbyterian Hospital at Chefoo, Shantung, for new equipment. The total amount of these appropriations, including sums payable in subsequent years, was $87,000. Since the funds available for this purpose are limited, effort is made to select for aid progressive institutions in large cities where the prospects for securing local support are best and where the widest influence can be exercised. Grants have thus far been made to only one Chinese hospital, but as time goes on it may be possible to extend the service to additional Chinese institutions, the best of which are already attaining standards not lower than those of the better mission hospitals.

The appropriations to mission hospitals for the salaries of additional foreign doctors and nurses have served to demonstrate that the foreign hospital in China, no less than the Chinese institutions, must depend for their future personnel more and more on the local medical and nurse training schools. Grants made as early as 1915,

for additional foreign doctors and nurses in two hospitals, remained unused in 1921; and under many appropriations made one and two years later, payments had not yet been called for, as the necessary workers had not been found. If effective relief is to be brought to the small hospital, therefore, the medical schools must first be helped to produce more and better qualified Chinese doctors and highly trained Chinese nurses.

There is no doubt that eventually such Chinese workers will prove far more useful than the average foreigner, who is always at a disadvantage when working in a country not his own. The gradual substitution of Chinese personnel, even at salaries equal to the very meagre salaries now paid to foreign missionaries, will bring great economies, for it is often forgotten that the total cost of maintaining a missionary in China is practically double the amount of his salary, on account of the cost of travel to and from the mission field and other special expenses that would not be incurred in the case of Chinese. It seems clear that it will be necessary to pay Chinese doctors larger salaries than in the past, yet even with the more liberal compensation there need be no fear that men will be induced to go into mission medical work from purely mercenary motives. Already, some well-qualified Chinese

doctors engaged in private practice have incomes much larger than the salary of any foreign medical missionary.

B. Fellowships and Scholarships

During the year 1921 the sum of $27,422.82 was expended on fellowships and scholarships for use in Peking and abroad. Twenty-four foreign doctors and five foreign nurses were designated for such aid during the year, and new grants were made to seven Chinese doctors and one Chinese dietitian. One fellowship was granted to an American teacher of physics to prepare him to aid in the development of pre-medical instruction in the Peking district. Special consideration is given to teachers in medical and pre-medical schools, and to nurses in hospitals where training schools are conducted. In the case of doctors in other than teaching hospitals the aid given is usually no more than enough to pay the ordinary tuition expenses in American schools.

Through the assistance of the Director of the Division of Medical Education of the Rockefeller Foundation, temporary teaching appointments at one of the leading medical schools of the United States were secured for two teachers in a medical school in China. These appointments, besides carrying a small compensation, afforded opportunities for a considerable amount of private

study and for intimate acquaintance with the methods of organization and teaching that have proved successful in the United States. The demand for assistants in the science departments of American universities is so much greater than the supply that there should be room for the extension of this service for the benefit of teachers on furlough from China, to whom practical experience of this sort would often prove even more useful than a year spent exclusively in study. The beneficial effects of these various aids to medical workers on furlough have been very marked in the raising of standards of medical schools and hospitals in China.

The results of the fellowships granted to Chinese doctors, nurses, pharmacists, and medical students for study in the United States have been particularly gratifying, in view of the general feeling in China that students sent abroad for study have not on their return justified the hopes that have been placed in them and have failed to find satisfactory employment. If the criticism is just in the case of men in other branches of learning—which is not yet clear—it is certainly not so in the case of most of the students whom the Board has aided. The following table shows the present status of forty-five Chinese who have been aided by the Board since the beginning of its work:

OCCUPATION	DOCTORS		NURSES	PHARMACISTS	TOTAL
	AT WORK	APPTS. ACCEPTED			
Institutional work:					
Peking Union Medical College	14	4	1	1	20
Hunan-Yale and Red Cross, Changsha	6	1	1	1	9
Shantung Christian University	1	..	..	1	2
St. John's University	1	..	..	..	1
Chinese Government Serum Institute	2	..	..	..	2
Chinese hospitals	2	..	1	..	3
Mission hospitals	2	..	..	..	2
In private practice	1		..	..	1
Present work not known	..		2	..	2
Died	1		..	..	1
Studying in U. S. without definite appointments	1		1	..	2
TOTALS	36		6	3	45

Some of the students aided are now among the most promising members of the faculties of medical schools, and practically all are usefully employed in institutions where they will have a chance to develop further under favorable conditions. The Chinese institutions in which five persons are reported are well organized and should provide opportunities for effective work. The three nurses who completed their training are doing good work in well-equipped hospitals in China, and a place is ready for the fourth, who will shortly complete her course. The two nurses whose present occupation is unknown did not receive any considerable aid. They were unable to complete their courses in the United States, one of them because of ill health.

C. Miscellaneous

Grants in aid of the translation and terminology work of the China Medical Missionary Association and the National Medical Association were continued during the year 1921. The preparation of a modern scientific terminology is of fundamental importance for the development of an independent Chinese medical profession. At present Chinese doctors educated under different foreign influences in China and abroad depend, for discussion of scientific matters, either on one of at least four foreign languages, English, French, German, or Japanese, or on different systems of entirely inadequate Chinese nomenclature. This has tended to break up the medical profession into numerous cliques which cannot easily have professional intercourse with one another. Under the auspices of the Ministry of Education a terminology commission has now been established, in which the Ministry and most of the higher educational institutions of the country are represented. This commission meets annually to discuss the work done by its members and to make recommendations to the government for the formal sanction of the terms agreed upon. Considerable progress has already been made with the terms for the fundamental sciences.

The Board has endeavored to assist in various ways the work of the newly organized Council on Hospital Administration of the China Medical Missionary Association. In 1921 the traveling expenses of members of the Council, to attend a meeting at Shanghai, were paid, and arrangements were made for experts in the employ of the Board or the Peking Union Medical College to attend the meeting and advise on architectural problems, purchasing, and X-ray installation. Dr. Houghton, at the request of the Association, prepared forms for mission hospital accounts, and one edition of account books printed according to these forms was published at the expense of the China Medical Board. These books are now in use in several hospitals in China. The X-ray department of the College has given advice regarding purchase of X-ray equipment, and has even assisted in the actual installation and repair of apparatus for mission and other hospitals.

An appropriation of $5,000 Mex. was made to the North China Union Language School, for repairs and equipment. The Peking Union Medical College depends on this school for the instruction in Chinese of those members of its foreign staff who need for their work at least some knowledge of the language of the people. The school has also been attended by some of the Chinese staff from the southern provinces, who

were not familiar with the language as spoken in North China.

An appropriation for emergency sanitary work was made during the famine of 1921, but, the relief organization being able eventually to care for this work themselves, the fund was not used.

While, under normal conditions, the China Medical Board does not itself undertake any public health activities, mention should be made of the very successful work of the Joint Council on Public Health Education maintained by the National Medical Association of China, the China Medical Missionary Association, the Young Men's and Young Women's Christian Associations and the China Christian Educational Association. The Council prepares literature on public and private hygiene and conducts public health campaigns in the leading cities. A laboratory is maintained at Shanghai, where charts and a number of ingenious devices have been prepared to illustrate important points in the lectures. A large collection of slides, and some moving picture films, are kept on hand for use by the staff or to be lent to persons all over the country for lecturing on public health. The extension department of the Shantung Christian University has also been participating actively in this work through a special public health exhibit in its museum and through largely attended popular

lectures. Such popular health education has a distinct bearing on the progress of medical education, since it serves to stimulate interest in study for the medical profession and incidentally gives the people an idea of the aims of the medical schools.

Two years ago the Council on Public Health Education conducted in the city of Foochow a very effective campaign of education against cholera, as a result of which the deaths from the disease were reduced to an insignificant number in that city while other cities in the province continued to suffer severely. This successful effort interested Chinese insurance men in the possibilities of public health work as a business proposition.

In other places outbreaks of plague, cholera, typhus, and other epidemics, in which Chinese and foreign physicians successfully co-operated to protect the communities in which they were working, not only served to draw the attention of the authorities and the people to the necessity for public health organization, but resulted also in increased support for local hospitals. In many cities physicians are being appealed to for aid in the medical inspection of school children and inmates of government institutions. Only the lack of adequately trained personnel appears to prevent the rapid development of such activities.

Toward the end of the year 1921 the first steps were taken for the organization of a purely Chinese national health association under the leadership of Dr. S. M. Woo, a graduate of the Johns Hopkins University Medical School, who took his public health course at Harvard and later served as health officer at Canton. This association has the support not only of the Chinese medical profession but of leading statesmen in all parts of the country, not even excepting the officials of the southern government at Canton. Among its purposes are the promotion of public health education in schools and colleges, the preparation of mobile units to fight epidemics, the demonstration of a modern health organization in a selected locality, the maintenance of a health museum, and research.

The International Health Board of the Rockefeller Foundation has contributed to the public health movement in China by assigning to the Peking Union Medical College a member of its staff, Dr. John B. Grant, as associate professor of hygiene and public health.

Publications of Staff Members, Peking Union Medical College, 1921

1. Preliminary survey of the parasites of vertebrates of North China. E. C. Faust, *China Medical Journal*, v. 35, p. 196–210, 3 tab., 3 charts.
2. Analyses of some Chinese foods. H. C. Embrey, *China Medical Journal*, v. 35, p. 247–257, 5 pls., 1 tab.

3. Bacteriological examination of smears from 1004 consecutive eye cases. T. C. Pa, *National Medical Journal of China*, v. 7, p. 52–53, 1 tab.
4. The office of Imperial physicians, Peking. E. V. Cowdry, *Journal of the American Medical Association*, v. 77, p. 307–316, 5 figs.
5. Intestinal parasitism in South Fukien. J. P. Maxwell, *China Medical Journal*, v. 35, p. 377–382.
6. Further statistics on communicable diseases among domestic servants. J. H. Korns, *China Medical Journal*, v. 35, p. 382–384, 3 tab.
7. The human trichomonas in North China. E. C. Faust, *American Journal of Hygiene*, v. 1, p. 410–418, 1 pl.
8. A comparison of ancient Chinese anatomical charts with the Fünfbilderserie of Sudhoff. E. V. Cowdry, *Anatomical Record*, v. 22, p. 1–13, 6 pls., 24 figs.
9. On an unusual anomaly of the Peroneus tertius in a Chinese. P. H. Stevenson, *Anatomical Record*, v. 22, p. 81–83, 1 fig.
10. The extrahepatic biliary tract of the camel. P. H. Stevenson, *Anatomical Record*, v. 22, p. 85–93, 2 figs., 1 tab., 1 pl., 4 figs.
11. The excretory system in digenea (trematoda): IV. A study of the structure and development of the excretory system in a cystocercous larva, Cercaria pekinensis nov. spec. E. C. Faust, *Parasitology*, v. 13, p. 205–212, 6 figs.
12. Ray's "hemolytic" test in kala-azar. R. H. P. Sia, *China Medical Journal*, v. 35, p. 397–399, 1 tab.
13. Agglutination titer following repeated intravenous injections of TAB vaccine. C. H. Han and C. W. Young, *China Medical Journal*, v. 35, p. 400–404, 2 figs.
14. The present state of the schistosome problem. E. C. Faust, *China Medical Journal*, v. 35, p. 405–410.
15. The investigation of some Chinese foods. H. C. Embrey, *China Medical Journal*, v. 35, p. 420–447, 36 charts.
16. The use of fine silk in surgery. A. S. Taylor, *China Medical Journal*, v. 35, p. 467–472, 1 chart.
17. Notes on South African larval trematodes. E. C. Faust, *Journal of Parasitology*, v. 8, p. 11–21, 2 figs., 1 pl., 13 figs.
18. A case of Glioma retinae. H. T. Pi, *China Medical Journal*, v. 35, p. 499–503, 3 pls.
19. A collection of Chinese embryos. P. H. Stevenson, *China Medical Journal*, v. 35, p. 503–520, 3 figs., 5 tab.
20. Mastoiditis in Peking. A. M. Dunlap, *China Medical Journal*, v. 35, p. 521–527.
21. Serum globulin in kala-azar. R. H. P. Sia and H. Wu, *China Medical Journal*, v. 35, p. 527–532, 6 tab.
22. Preliminary survey of the intestinal parasites of man in the Central Yangtze valley. E. C. Faust and C. M. Wassell, *China Medical Journal*, v. 35, p. 532–561, 1 chart, 5 tab.
23. Toxicity of antimony in rabbits. J. H. Korns, *China Medical Journal*, v. 35, p. 564–566, 1 tab.

24. Filariasis in China. J. P. Maxwell, *Philippine Journal of Science*, v. 19, p. 257–327, 7 tab., 4 figs., 25 pls.
25. The menace of insanity to popular government. A. H. Woods, *National Medical Journal of China*, v. 7, p. 201–204.
26. Result of refraction in the Peking Union Medical College. T. T. Dzen, *National Medical Journal of China*, v. 7, p. 206–308, 4 tab.
27. A study of trichomonas of the guinea-pig from Peking. E. C. Faust, *Archiv für Protistenkunde*, v. 44, p. 115–118, 1 fig., 1 tab., 1 pl.
28. Incidence of vaccination and smallpox in North China. J. H. Korns, *China Medical Journal*, v. 35, p. 561–563.
29. Studies on the retina: Histogenesis of the visual cells in amblystoma. S. R. Detwiler and H. Laurens, *Journal of Comparative Neurology*, v. 33, p. 493–508, 13 figs.

DIVISION OF MEDICAL EDUCATION

Report of the General Director

To the President of the Rockefeller Foundation:

Sir:

I have the honor to submit herewith my report as General Director of the Division of Medical Education for the period January 1, 1921, to December 31, 1921.

Respectfully yours,
RICHARD M. PEARCE,
General Director.

DIVISION OF MEDICAL EDUCATION

During 1921 the Division of Medical Education, in pursuance of the objects for which it was established in December, 1919, included in its program the following main activities: (1) surveys of medical education in the Far East; (2) resident counsel in the development of the Peking Union Medical College at Peking, China, and studies of conditions in medicine and pre-medical science throughout China; (3) co-operation in programs of medical education in the Americas and Europe; and (4) arrangements for observation and study by commissions and fellows.

I. Surveys in the Far East

The Director of the Division spent the year 1921 in the Far East. Here he made surveys of the conditions and requirements of medical education in various localities, including Japan, Hong Kong, Siam, the Philippines, the Straits Settlements, and Indo-China, as well as in China proper. Following is a brief summary of conditions as observed in these countries and districts.

Japan

In Japan and regions under Japanese influence medical education is making rapid progress.

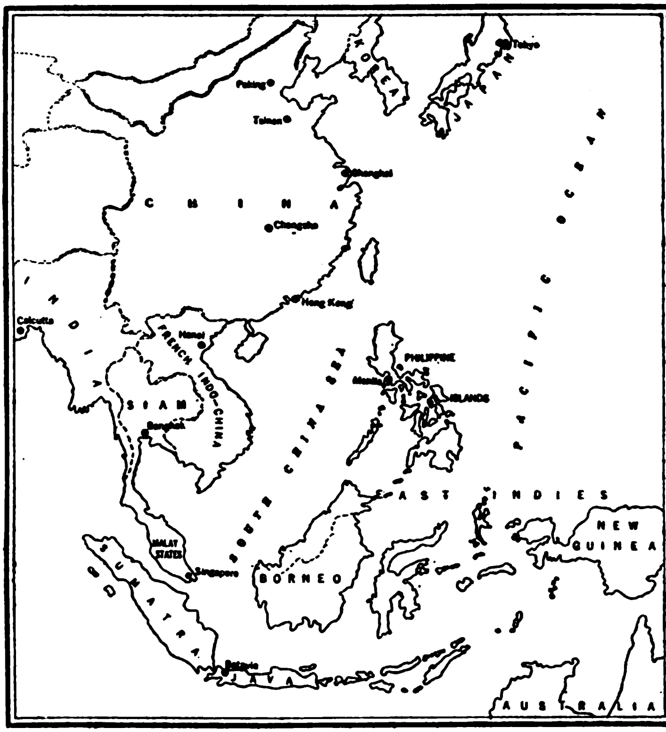


Fig. 87.—Important schools of medicine in the Far East

The organization of the medical schools is similar to that of German schools. The best of these institutions are on a level with those of other progressive countries. The Japanese seem abundantly able to carry out needed developments in the fields of medical education and research.

Hong Kong

In countries surrounding the South China Sea it is notable that medical schools have been

established and maintained at chief points on regular trade routes. Hong Kong, Manila, and Singapore are such ports of call for ocean traffic in this region, maintaining contact with a wide surrounding territory. The University of Hong Kong, for example, has in the last seven years enrolled 114 medical students, drawn from different areas as follows: fifty from the Straits Settlements, thirty-seven from Hong Kong itself, nineteen from various parts of China proper, two each from India, the Philippines, and Siam, and one each from Australia and Sumatra. Hong Kong is one of the two commercial centers of southern China. The nearest medical schools to the south, are at Manila, Bangkok, and Singapore, and to the north, at Shanghai. Being a British colony, it has the advantage of offering the Chinese student association with European institutions and point of view while allowing him to keep in touch with the best of Chinese life and traditions. The Faculty and Senate of the University of Hong Kong have developed good laboratories and are interested in medical teaching on an academic basis. From lack of funds they have been unable to put into effect their complete plans for teaching organization.

Siam

Recently interest in public health and medical education has developed in Siam, and an admir-

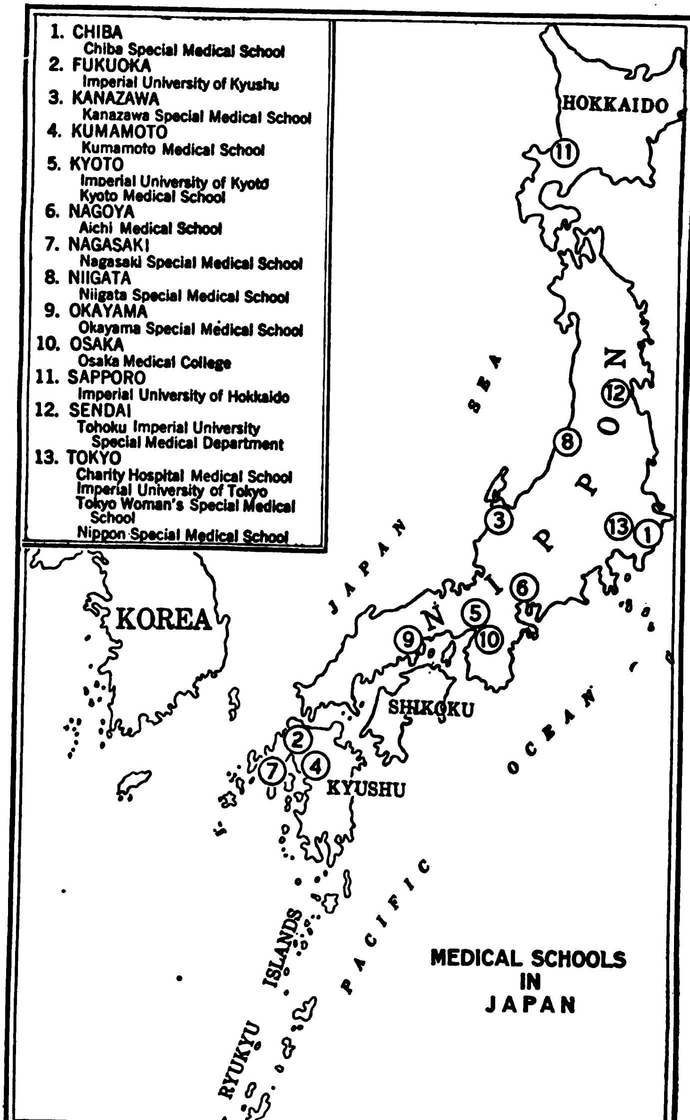


Fig. 88.—Medical schools in Japan

able plan has been made for public health organization. The chief difficulty is lack of personnel to administer the actual work. Siam illustrates the final dependence of public health programs on adequate medical education. It is estimated that 95 per cent of the inhabitants have no other medical attention than that of the native-trained Siamese or Chinese doctors, or that of priests, "spirit doctors," and so forth. Possibly not more than 1 per cent, and these only in Bangkok or in mission centers, can have the attention of physicians trained in modern medicine. In this connection it should be borne in mind that Siam is an agricultural country, with small, widely scattered communities and only two cities of more than 10,000 inhabitants. Few of these communities could under any circumstances maintain a modern medical practitioner. The desire for modern medical treatment is still to be inculcated in the mass of the Siamese by the government medical and public health services. These government services themselves, however, to carry out their programs need both well-trained, fully qualified doctors and also men of shorter training to serve as sanitary inspectors, hospital assistants, and so forth. At present not enough men are being trained to meet the demands of government services alone. This condition is due to several

causes: the period of training for medicine is longer than for any other profession in Siam, while the financial returns are not greater. In fact, the income of physicians is not so large as that of lawyers, for whom the course of study is three years shorter. The problem is further complicated by the small number of graduates of secondary schools—at present forty to seventy men a year—from which to recruit all the professions.

The Royal Medical College of Bangkok is a department of the Chulalonghorn University and is under direct control of the Minister of Education, who is responsible only to the King. The buildings of the medical school are inadequate for the purposes for which they are now used. It is believed, however, that they represent a nucleus of laboratories and hospital buildings around which a creditable medical school could be developed.

Straits Settlements

The King Edward VII Medical School at Singapore, although it has received considerable endowment from local merchants, is an integral part of the Colonial Government and essentially a sub-department of the Medical Service of the Straits Settlements and the Federated Malay States. It was not established primarily for the

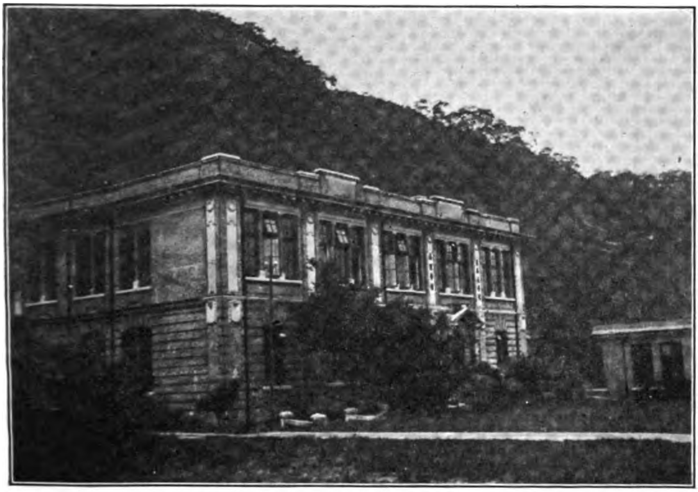


Fig. 89.—Building for pathology and tropical medicine, Faculty of Medicine, Hong Kong University

Fig. 90.—College of Medicine and Surgery, University of the Philippines, Manila

Fig. 91.—Wing of General Hospital, Manila, Philippine Islands

Fig. 92.—New medical building, University of Alberta, Edmonton, Province of Alberta, Canada

training of private practitioners, but for supplying the needs of the Medical Service. Scholarships are provided for about 90 per cent of its students and preference is now given to applicants from local sources, although formerly about half the students came from India and Ceylon—none from Siam. It is understood that the standard of student qualifications has been raised to that of an English university medical school. As the school is not a department of a university, however, it cannot grant degrees, although it gives the diploma of Licentiate in Medicine and Surgery. Plans have been approved for medical teaching on a university basis, but recent financial depression has made it necessary to postpone putting these into effect. The school is of the greatest importance in the field for which it was established—that of satisfying the Government's needs in medical and public health personnel.

Indo-China

In Indo-China the Government maintains a medical school at Hanoi. This school in the past has been concerned chiefly with the training of men for the Colonial Government services, such men entering the medical school without extensive preliminary training. During the past year, in view of the development of the University at Hanoi, a more thorough system of teach-

ing has been developed, and at the end of four years in Hanoi students will be sent to France for a year of postgraduate instruction. Thus far, only a small number of students have entered the higher course, and the older school with lower standards continues.

Philippine Islands

In the Philippines, Governor General Leonard Wood, himself a physician, is eager to develop in every way the medical and public health resources of the Islands. He has invited the co-operation of the Rockefeller Foundation and of its International Health Board. The invitation has been accepted on the part of the International Health Board, and the Division of Medical Education hopes to be able to participate by lending temporarily the services of an associate dean for the College of Medicine and Surgery of the University of the Philippines.[1] The pre-medical departments of the University—physics, chemistry, and biology—are spaciously housed, well-equipped, well-manned, and doing good work. The Medical School itself has excellent laboratories, it is in close affiliation with the Manila General Hospital,

[1] In March, 1922, Dr. William S. Carter, Dean of the University of Texas Medical School, on leave of absence, sailed for Manila to accept this post.

and the prospects for development under Filipino management are good. It is thought, however, that this development can be hastened by continued co-operation for the present on the part of those interested in Western medicine.

II. Peking Union Medical College and Studies in China

For the greater part of the year, the Director of the Division of Medical Education served in China, making for the China Medical Board of the Rockefeller Foundation a general survey of medical and pre-medical education in China, and acting in an advisory capacity to the Peking Union Medical College. The College which has been erected and is being maintained by funds from the Rockefeller Foundation, was going through a formative period with the completion of its new buildings and the installation of its various departments in their permanent quarters. Problems of organization had consequently to be solved. The Director of the Division served also as Acting Director of the College for several months during the absence of Director Henry S. Houghton. A further account of the work in China during 1921 will be found in the annual report of the China Medical Board.

III. The Americas and Europe

The United States

In the United States the Foundation co-operated with the General Education Board in support of plans for reorganizing and rebuilding the medical schools of Columbia University and the University of Chicago.

Canada

In the various Canadian medical schools to which the Foundation in 1920 pledged assistance progress was made during 1921.

At **Dalhousie University**, Halifax, the facilities of the compactly arranged group of buildings representing the medical school and hospital have recently been enlarged by the erection, under the Salvation Army, of a maternity hospital, soon to be opened. Toward the cost of this hospital an additional appropriation of $50,000 was made by the Foundation to the University.

The $6,000,000 endowment fund for which **McGill University**, Montreal, conducted a campaign, was oversubscribed. The Foundation's 1920 pledge of $1,000,000 to this fund was paid in full during 1921. The University has practically completed its new biological building and has made arrangements preparatory to the building of a new institute of pathology.

The **University of Toronto,** with aid from the Provincial Government, has proceeded with its building of an institute of anatomy, which by the end of the year was well under way. Plans for the erection of a psychiatric hospital by the city of Toronto on a site granted by the University are in course of preparation.

The **University of Manitoba,** at Winnipeg, received from the Manitoba Legislature during 1921 appropriations sufficient to meet the conditions of the Foundation's pledge of 1920. Payments on this pledge were accordingly begun. One of the new Medical College buildings was put into use in the course of the year; and at the end of the year the second building was about to be opened.

Appropriation of $25,000 was continued for a second year to the **University of Alberta,** at Edmonton. An appropriation of a similar sum was also made for a second year to the **University of Montreal,** teaching in French, which has through this appropriation made progress in developing the sciences preliminary to medicine—developments which it is hoped will have a far-reaching influence in the training of the French medical profession of Canada.

Brazil

Following various surveys of medical and public health conditions in Brazil, and co-opera-

tion by the Foundation's International Health Board in establishing a department of hygiene in the *Faculdade de Medicina e Cirurgia* at São Paulo, the Foundation was requested by the *Faculdade* to select an American professor to build up a modern department of pathology in this school. During 1921 Dr. Oskar Klotz, then professor of pathology and bacteriology in the University of Pittsburgh, was chosen for this post for a period of two years, and entered upon his duties. Provision has been made by the Foundation for supplying Dr. Klotz with necessary assistants and scientific equipment for this work.

France

The attention of the Rockefeller Foundation was called to the fact that the Pasteur Institute in Paris, which maintains several branches, including those in Lille, Algiers, West Africa, and Indo-China, was suffering materially in the post-war period, not only from the high cost of necessary supplies, but also from the high cost of living which forced several of its scientists to seek positions elsewhere in order to maintain themselves. To meet this temporary situation the Foundation gave to the Institute $30,000 for its work in 1921, and pledged $25,000 and $20,000 respectively for 1922 and 1923, with no further commitment for the future. It is expected that

Fig. 93.—The new medical center in Brussels. The group of buildings shown in the architect's sketch, combining a medical school and laboratories, a hospital, and a nurses' home and training school, are being constructed by the University of Brussels and the Hospital Board of the municipality with the aid of the Rockefeller Foundation

Fig. 94.—Institute of Anatomy, University College, University of London. Architect's drawing of one of the new Institutes being erected with Foundation aid

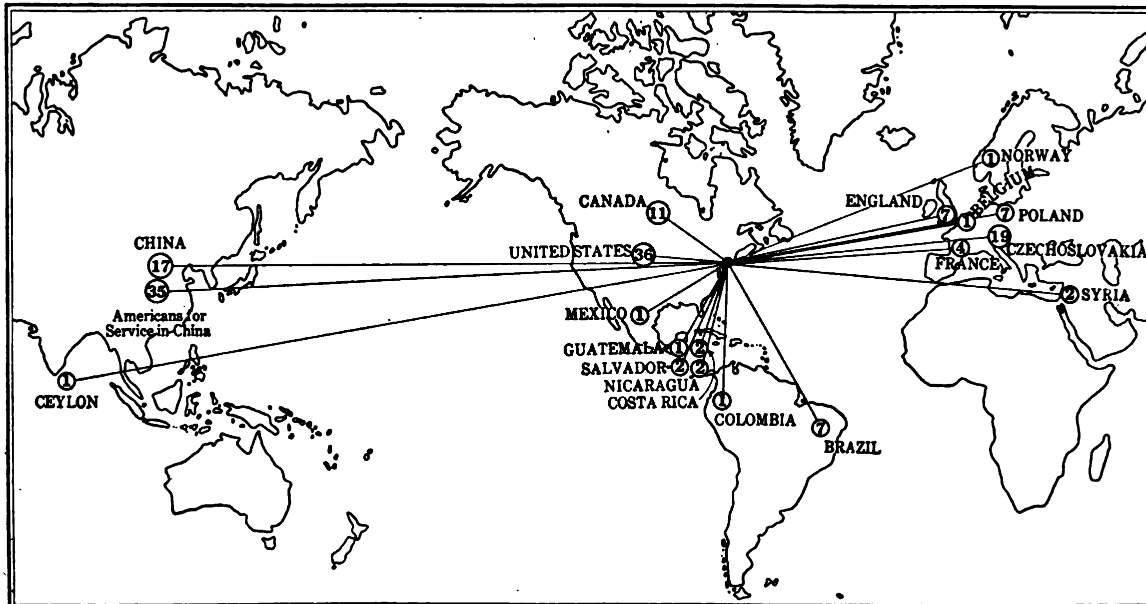


Fig. 95.—Fellows from eighteen countries. Fellowships for which funds were directly or indirectly supplied by the Rockefeller Foundation were held by 157 individuals in 1921. Fellowships granted directly by the Foundation are designed to fit men and women for leadership and technical efficiency in preventive medicine and medical education

these funds will be used largely for the training of new personnel, through the granting of fellowships and the supplying of equipment requisite for such training.

Belgium

Progress was made toward rebuilding and reorganizing the medical school of the Free University of Brussels, to concentrate its facilities and co-ordinate the efforts of many agencies. Conferences were held in Brussels by the President of the Foundation and a representative of the General Education Board; a pledge of $250,000—in addition to the earlier pledge of 40,000,000 francs to this medical school—was made by the Foundation for endowment of the teaching hospital of the school; additional land was ceded to the medical school by the city of Brussels; and the architect has studied hospital and laboratory construction in England, Canada, and the United States, as the guest of the Foundation and has almost completed the first draft of plans for the new buildings.

England

With University College and University College Hospital in London the final contracts in regard to their medical school, by which the Rockefeller Foundation agreed to give 1,205,000 pounds for buildings, equipment, and endowment were

executed. The new Anatomy Building made rapid progress, and desired property has been secured for the hospital building. Decline in building costs has worked to the advantage of the medical school. A large number of entering students has been reported. Development of the full-time, or *unit*, system of teaching here is being watched with interest throughout Great Britain.

Central Europe

To enable the universities of Continental Europe to keep in touch with the developments of medical science in England and America, temporary aid in the supplying of important English-language medical journals was continued in 1921 for a second year to the medical schools of countries suffering from adverse exchange. The journals were paid for by the recipients at pre-war rates of exchange. By this means schools were enabled to maintain their files of important journals at a time when financial conditions would otherwise have made it impossible for them to continue their subscriptions. A few of the more important medical centers were helped also to obtain necessary scientific equipment which had been depleted during the war.

Medical journals were supplied during 1921 to medical school libraries in the following cities: Gratz, Innsbruck, and Vienna, in Austria;

Brussels and Ghent, in Belgium; Bratislava, Brno, and Prague, in Czechoslovakia; Lyons and Paris, in France; Berlin, Breslau, Frankfort, Freiburg, Göttingen, Greifswald, Hamburg, Hanover, Heidelberg, Jena, Kiel, Cologne, Leipsig, Marburg, Munich, Rostock, Tübingen, Wiesbaden, and Würzburg, in Germany; Budapest in Hungary; Bologna, Genoa, Naples, Rome, and Turin, in Italy; Belgrade and Zagreb in Jugoslavia; and Cracow, Lwow, and Warsaw, in Poland; and also to Russian scientists, to whom they were distributed through an agency in London.

IV. Commissions and Fellowships

Commissions

To promote international exchange of medical experience and thus to increase the common fund of knowledge to which all nations contribute and upon which each may freely draw, the Foundation has sought to encourage visits and conferences between medical educators of different countries and the postgraduate study of medicine by visiting fellows who will return to definite posts in their own countries. In following out the first part of this program, the President of the Foundation during the year visited the medical centers in London and Brussels, first with a representative of the General Education

Board, and again with the General Director of the Foundation's International Health Board.

From several countries commissions made up of individuals concerned in one way or another with problems of medical education paid visits, as guests of the Foundation or its departmental boards, to medical centers of England, Canada, and the United States.

A commission of two—Mr. Armand Goossens-Bara and Mr. J. B. Dewin—came from Belgium to the United States in July and later went to England to study the construction and administration of hospitals and medical schools, in the interest of the new medical center being built in Brussels by the aid of the Foundation. Mr. Goossens-Bara is president of the *Conseil des Hospices*, the board which administers the public hospitals of the city of Brussels, including the teaching hospital of the medical school of the Free University of Brussels. Mr. J. B. Dewin is the architect appointed by the University to plan the buildings of the new medical center. Certain problems in the teaching of medicine were studied in London by three members of the faculty of the University of Brussels—Dr. A. Brachet, professor of anatomy, Dr. Paul Vandervelde, professor of pathological anatomy, and Dr. René Verhoogen, professor of pathology.

During the months of May and June, Sir

Wilmot Herringham, chairman of the Committee on Medical Education of the University Grants Committee and Sir Walter Fletcher, secretary of the Medical Research Council (English Privy Council) visited representative institutions of medical education and research in Canada and the United States. Also, in connection with the plans of the University College Hospital Medical School, Dr. A. E. Boycott, professor of pathology, and Dr. C. C. Choyce, professor of surgery, paid a visit to the United States and Canada to study methods of medical education and research.

In September three Serbian physicians arrived in New York to study medical education, hospital organization, and public health administration in representative institutions of the United States and Canada. On this commission were Dr. Georges J. Nikolitch, under-secretary and first medical officer of the Ministry of Health of the kingdom of the Serbs, Croats, and Slovenes, Dr. Georges Joannovitch, professor of pathological anatomy, and Dr. Radenko Stankovic, professor of internal medicine, in the University of Belgrade. On leaving the United States they proceeded to England on the same mission.

Dr. Carlos Chagas, director of the Oswaldo Cruz Institute at Rio de Janeiro, and Director General of the National Department of Health

of Brazil, spent the months of May and June in the United States visiting medical and public health institutions.

Fellowships

One of the Foundation's most profitable fields of work has been the training, under fellowships, of men from other countries who intend to return home to occupy positions of responsibility as teachers, investigators, or public health officials. In addition to promoting international co-operation, continued experience has shown that the training of scientists and educators for work in their own countries is the best way in the long run to build a firm foundation for medical teaching and research. From small beginnings, the selection and assistance of fellows has developed into an appreciable part of the work of the Foundation—so much so that it has been found necessary to place in charge of one man, Dr. Clifford W. Wells, the immediate responsibility for the fellowships of the Foundation and its boards. Aside from the fellowships in physics and chemistry supported by the Rockefeller Foundation and administered by the National Research Council, a total of 123 Foundation fellowships were in force in the course of the year 1921. Of these, fellowships under the Division of Medical Education were held by

men representing the following institutions, with most of which the Foundation has otherwise co-operated: in Belgium, the Free University of Brussels; in Brazil, the *Faculdade de Medicina e Cirurgia* in São Paulo and Oswaldo Cruz Institute in Rio de Janeiro; in Canada, the University of Alberta at Edmonton, Dalhousie University at Halifax, the University of Manitoba at Winnipeg, and the University of Montreal; in England, University College, London; and in Syria the American University of Beirut.

During the past two years, from different sides, the attention of both the Rockefeller Foundation and the General Education Board has been called to the shortage of medical teachers in the United States. The problem was discussed by officers and members of the General Education Board, and by them submitted to a larger group interested in medical education, including officers of both organizations. A report of the conclusions of this group resulted in the passage by the Foundation and the General Education Board of concurrent resolutions which look toward co-operation between these organizations and the National Research Council in establishing a system of fellowships which should tend to satisfy the present needs of medical schools for teachers who are both competent instructors and original investigators.

THE ROCKEFELLER FOUNDATION

Report of the Treasurer

New York, February 9, 1922

To the President of the Rockefeller Foundation:

Sir:

I have the honor to submit herewith my report of the financial operations of the Rockefeller Foundation and its subsidiary organizations for the period January 1, 1921, to December 31, 1921.

Respectfully yours,

L. G. MYERS,

Treasurer.

TREASURER'S REPORT

During the year 1921 income from general principal fund and from income temporarily invested amounted to $8,702,689.70. Undisbursed income carried over from 1920, after adding sundry refunds, amounted to $6,286,669.69. A total of $14,989,359.39 was therefore available for disbursement. Disbursements during the year amounted to $7,630,358.49, leaving a balance of $7,359,000.90.

On December 31, 1921, the total of all unpaid appropriations and pledges amounted to $23,219,394.11, as follows:

Balance due on appropriations payable in 1921 and prior years.....		$4,032,997.71	
Appropriations and pledges which become effective in 1922 and following years:			
1922............	$6,280,746.40		
1923............	4,619,892.00		
1924............	3,460,067.00		
1925............	2,596,191.00		
1926............	2,229,500.00		
		19,186,396.40	
			$23,219,394.11

The undisbursed balance of income amounting to $7,359,000.90, reported above, is thus exceeded by the total of all unpaid appropriations and pledges to the extent of $15,860,393.21. This undisbursed balance does, however, exceed unpaid appropriations due in 1921 and prior years ($4,032,997.71) by the sum of $3,326,003.19. Appropriations and pledges effective in 1922, amounting to $6,280,746.40, will be more than covered by 1922 income estimated at $8,000,000.00; while appropriations and pledges effective in 1923 and subsequent years will be met with income to be received in those years.

General principal funds, including the reserve fund, increased during the year from $174,315,913.06 to $174,395,157.50, a difference of $79,244.44. This is accounted for by gains on sales of securities amounting to $63,169.24, and by gains on sales of land in China, amounting to $16,075.20.

Income expended for land, buildings, and equipment, almost wholly in China, amounted to $1,156,227.71, which, added to the balance carried over from 1920, made a gross total of $8,709,063.12. Depreciation of equipment, sales of land and material, and a small gift of books, amounting in all to $42,250.25, reduced this sum to a net total of $8,666,812.87.

Since the close of the year the accounts of the Comptroller, the accounts of the Treasurer, and the securities owned by the Corporation have been examined by Messrs. Lybrand, Ross Bros. & Montgomery, Accountants and Auditors. A report of their work rendered to the Chairman of the Board of Trustees will be found on page 408.

The financial condition and operations are set forth in the appended exhibits listed below:

EXHIBIT A

BALANCE SHEET, DECEMBER 31, 1921

ASSETS

I. Investments			
General Fund			
General Schedule (Exhibit Q)		$177,694,831.93	
Less amount of income invested (see below)		3,299,674.43	
			$174,395,157.50
Special Funds (Exhibit R)			116,800.00
			$174,511,957.50
II. Land, Buildings, and Equipment			
In China		$8,631,832.92	
In New York		34,979.95	
			$8,666,812.87
III. Income Accounts			
Special Funds			
Cash on deposit in New York			$4,862.20
General Fund			
Cash on deposit in New York		$64,599.82	
Cash in London: £24,826–6–6 at $3.7523		93,156.44	
Cash in Brussels: Francs 20,840,577.05 at 7.3638¢		1,534,685.92	
Moneys loaned		800,000.00	
Income invested temporarily (Exhibit Q)		3,299,674.43	
Funds in hands of agents, to be accounted for, and sundry accounts receivable	$1,573,108.08		
Less accounts payable	6,223.79		
		1,566,884.29	
Total		$7,359,000.90	
Excess of appropriations and pledges over income available		15,860,393.21	
			23,219,394.11
			$23,224,256.31
Grand Total			$206,403,026.68

EXHIBIT A

BALANCE SHEET, DECEMBER 31, 1921

FUNDS AND OBLIGATIONS

I. FUNDS			
General Fund (Exhibit N)		$171,204,624.50	
Reserve Fund (Exhibit N)		3,190,533.00	
			$174,395,157.50
Special Funds			
Gift of John D. Rockefeller		$37,000.00	
Gift of Laura S. Rockefeller		49,300.00	
Henry Sturgis Grew Memorial Fund		25,000.00	
Arthur Theodore Lyman Endowment		5,500.00	
			116,800.00
			$174,511,957.50
II. LAND, BUILDINGS, AND EQUIPMENT FUND			
Appropriations from income (Exhibit O)			$8,666,812.87
III. INCOME ACCOUNTS			
Special			
Estate Laura S. Rockefeller Fund (Exhibit B)		$64.77	
Henry Sturgis Grew Memorial Fund Income (Exhibit B)		4,082.95	
Arthur Theodore Lyman Endowment Fund Income (Exhibit B)		714.48	
			$4,862.20
General Fund			
Balance due on appropriations payable in 1921 and prior years (Exhibit L)		$4,032,997.71	
Appropriations and pledges which become effective in 1922 and following years:			
1922	$6,280,746.40		
1923	4,619,892.00		
1924	3,460,067.00		
1925	2,596,191.00		
1926	2,229,500.00		
		19,186,396.40	
			*23,219,394.11
			$23,224,256.31
GRAND TOTAL			$206,403,026.68

*The total of all unpaid appropriations and pledges is $15,860,393.21 in excess of the balance of general fund income amounting to $7,359,000.90, as shown on opposite page, but it will be noted that these obligations become effective over a term of years, thus permitting their satisfaction gradually as the income of the respective years is received.

EXHIBIT B

STATEMENT OF RECEIPTS AND DISBURSEMENTS OF INCOME

GENERAL FUND

Receipts

Balance, December 31, 1920		$6,204,316.39	
Refunds of payments made in prior years			
The Rockefeller Foundation	$27,115.03		
China Medical Board	52,704.12		
International Health Board	2,534.15		
		82,353.30	
			$6,286,669.69
Income from principal funds and from income invested temporarily			8,702,689.70
			$14,989,359.39

Disbursements

International Health Board (Exhibit J)		
Hookworm, county health work, malaria and yellow fever	$921,799.42	
Tuberculosis in France	438,951.25	
Public Health education and fellowships	82,696.53	
Miscellaneous	62,814.38	
Administration	122,990.56	
		$1,629,252.14
China Medical Board (Exhibit K)		
Medical education		
Peking Union Medical College		
Land and buildings	$1,114,973.36	
Operation	393,349.37	
Shanghai Medical School		
Land and buildings	41,059.02	
Unaffiliated medical schools	27,290.76	
Pre-medical education	78,013.25	
Hospitals—Mission and Chinese	143,601.38	

Translation of medical and nursing textbooks	6,368.69		
Fellowships and scholarships	27,422.82		
Miscellaneous	9,773.39		
Administration	113,598.42		
		1,955,450.46	
MEDICAL EDUCATION (Exhibit C)		2,156,216.68	
SCHOOLS OF HYGIENE AND PUBLIC HEALTH (Exhibit D):			
Johns Hopkins University		281,874.87	
Harvard University		41,500.00	
RESEARCH IN PHYSICS AND CHEMISTRY (Exhibit E)		60,573.88	
MENTAL HYGIENE (Exhibit F)		86,370.57	
HOSPITAL, DISPENSARY, AND NURSING STUDIES AND DEMONSTRATIONS (Exhibit G)		84,822.71	
WAR WORK (Exhibit H)		2,682.16	
MISCELLANEOUS (Exhibit I)		1,161,491.68	
ADMINISTRATION (Exhibit I)		170,123.34	
			7,630,358.49
Income on hand December 31, 1921			$7,359,000.90
Income on hand December 31, 1921, is accounted for as follows:			
Cash in New York		$64,599.82	
Cash in London		93,156.44	
Cash in Brussels		1,534,685.92	
Moneys loaned		800,000.00	
Income invested (Exhibit Q)		3,299,674.43	
Funds in hands of agents, to be accounted for, and sundry accounts receivable	$1,573,108.08		
Less accounts payable	6,223.79		
		1,566,884.29	
		$7,359,000.90	

EXHIBIT B—*Continued*

SPECIAL FUNDS

LAURA S. ROCKEFELLER FUNDS

Income collected during the year ending December 31, 1921	$3,000.00
Amounts paid to the several societies designated by Mrs. Rockefeller	3,000.00

JOHN D. ROCKEFELLER FUND

Income collected during the year ending December 31, 1921	$1,850.00
Amounts paid to the several societies designated by Mr. Rockefeller	1,850.00

ESTATE LAURA S. ROCKEFELLER FUND

Balance of income December 31, 1920	$28,753.63
Balance of appropriation of $212,688.86 paid to Fifth Avenue Baptist Church	28,688.86
Balance accounted for in cash on deposit	$64.77

HENRY STURGIS GREW MEMORIAL FUND

Balance December 31, 1920	$2,984.33
Income collected during the year ending December 31, 1921	1,098.62
Accounted for in cash on deposit	$4,082.95

ARTHUR THEODORE LYMAN ENDOWMENT

Balance December 31, 1920	$465.86
Income collected during the year ending December 31, 1921	248.62
Accounted for in cash on deposit	$714.48

EXHIBIT C

1921 FOUNDATION APPROPRIATIONS,

UNPAID BALANCES OF APPROPRIATIONS MADE IN PREVIOUS YEARS, AND PAYMENTS THEREON MADE IN 1921

MEDICAL EDUCATION

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
Austria, Hungary, Poland, Czechoslovakia, and Jugo-Slavia			
To co-operate with the Medical Schools of the Universities of Vienna, Prague, Innsbruck, Budapest, and Gratz, in the rehabilitation of their scientific equipment for teaching and research (R.F. 2495, 2581)*	$99,893.40	$50,000.00	$28,517.44
Belgium			
Expenses of visit to England and the United States of representatives of the University of Brussels (R.F. 2577, 2498)	742.29	5,000.00	3,796.80
Brazil			
Oswaldo Cruz Institute, Rio de Janeiró. For extending its work in pathology (R.F. 2485)	3,000.00	....	2,131.13
Oswaldo Cruz Institute. For traveling expenses of successor to Dr. B. C. Crowell (R.F. 2487)	1,000.00	....	....
São Paulo University Salary of Professor of Pathology—$4,000 per year for three years beginning 1920–21 (R.F. 2486)			
(Instalment due 1920–21)	4,000.00	....	....
(Instalment due 1921–22)	....	4,000.00	....
Faculdade de Medicina e Cirurgia, São Paulo. To cover traveling expenses of Professor of Pathology and family to Brazil, and supplement salary during the years 1921 and 1922 (R.F. 2551, 2552, 2554, 2589)	....	15,600.00	8,128.19

*The figures in parentheses, following the text describing the purpose of each appropriation, are the serial numbers of the resolution of the Board or Executive Committee, authorizing the payment.

EXHIBIT C—*Continued*

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
MEDICAL EDUCATION—*Continued*			
Brazil—*Continued*			
Faculdade de Medicina e Cirurgia, São Paulo. Scientific equipment and assistants for Department of Pathology (R.F. 2569)	$........	$5,000.00	$1,909.21
Canada			
University of Alberta. For the development of work in clinical branches (R.F. 2489, 2582)	18,750.00	25,000.00	31,250.00
Dalhousie University. For the improvement of clinical facilities (R.F. 2571)	....	50,000.00	....
University of Manitoba. For interest on pledge of $500,000 for general endowment (R.F. 2570)	....	25,000.00	25,000.00
McGill University. For interest on pledge of $1,000,000 for general endowment (R.F. 2549, 2625)	....	52,602.74	52,602.74
McGill University. For general endowment of its Faculty of Medicine (R.F. 2601)	....	1,000,000.00	1,000,000.00
Université de Montréal, Faculty of Medicine. For the development of laboratories (R.F. 2488, 2580)	12,500.00	25,000.00	25,000.00
University of Toronto. For interest on pledge of $1,000,000 for general endowment (R.F. 2567)	....	50,000.00	25,000.00
England			
Expenses of visit to the United States of medical educators (R.F. 2482, 2490, 2562)	6,725.35	3,000.00	6,184.86
University of London. For interest on pledge of £180,000 for general endowment of University College (R.F. 2556)	....	36,000.00	33,646.87

University of London. Toward building and equipment program of University College, £200,000 (R.F. 2541)	....	775,000.00	711,275.23
University of London. For interest on pledge of £435,000 for general endowment of the University College Hospital Medical School (R.F. 2557)	....	87,000.00	81,374.29
University of London. Toward building and equipment program of the University College Hospital Medical School, £50,000 (R.F. 2504)	....	212,500.00	....
France			
Pasteur Institute. Towards its work during 1921 (R.F. 2559)	....	30,000.00	30,000.00
Servia			
Expenses of visit to the United States of representatives of the Belgrade Medical School (R.F. 2576)	....	8,000.00	5,017.93
United States			
University of Chicago			
Interest on pledge of $1,000,000 for the development of a medical school (R.F. 2430, 2515)	18,988.82	50,000.00	43,739.53
New York University			
To provide facilities for teaching preventive medicine, hygiene, and sanitation (R.F. 2572)	....	35,000.00	10,000.00
Fellowships			
Grants to doctors for medical study (R.F. 2499–2502, 2467, 2477, 2491, 2543, 2544, 2553, 2563)	9,868.42	38,850.00	17,573.89
Division of Medical Education			
Administration (R.F. 2469, 2516)	11,752.33	22,000.00	14,068.57
TOTALS	$187,220.61	$2,604,552.74	$2,156,216.68

EXHIBIT C—*Continued*

		PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
MEDICAL EDUCATION—*Continued*				
Unexpended balances of appropriations allowed to lapse—				
Oswaldo Cruz Institute (R.F. 2487)	$1,000.00			
São Paulo University (1920) (R.F. 2486)	4,000.00			
Travel—University of Brussels (R.F. 2498)	742.29			
London Medical Educators (R.F. 2490)	551.18			
Fellowships (R.F. 2500–2502, 2467, 2477, 2491)	9,868.42			
Division of Medical Education (R.F. 2469)	11,676.30			
University of Chicago (R.F. 2430)	15,163.68			
		$43,001.87	$........	$........
São Paulo University (1921) (R.F. 2486)	$4,000.00			
London Medical Educators (R.F. 2562)	2,989.31			
University of London (R.F. 2556)	2,353.13			
University of London (R.F. 2541)	63,724.77			
University of London (R.F. 2557)	5,625.71			
Fellowships (R.F. 2499, 2552, 2563, 2544)	21,276.11			
Division of Medical Education (R.F. 2516)	4,000.00			
		....	103,969.03	....
NET TOTALS		$144,218.74	$2,500,583.71	$2,156,216.68

EXHIBIT D

SCHOOLS OF HYGIENE AND PUBLIC HEALTH

		Prior Appropriations	1921 Appropriations	1921 Payments
Harvard University—School of Public Health				
For interest on pledge of $1,160,000 for endowment (R.F. 2585)		$........	$29,000.00	$29,000.00
For buildings and equipment (R.F. 2578)		....	500,000.00	....
Toward cost of operation during the year 1921 (R.F. 2586)		....	12,500.00	12,500.00
Johns Hopkins University—School of Hygiene and Public Health				
For the establishment of a School of Hygiene and Public Health (R.F. 2170)		167,025.92	....	4,671.10
Operating Expenses (R.F. 2417, 2462, 2506)		90,900.78	250,000.00	240,020.76
Building Alterations (R.F. 2358, 2408, 2447)		28,756.88	....	22,387.03
Furniture (R.F. 2409, 2448)		10,440.11	....	8,453.06
Equipment (R.F. 2410)		5,147.39	....	5,129.37
Replacing records destroyed by fire (R.F. 2449)		1,313.15	....	1,213.55
Totals		$303,584.23	$791,500.00	$323,374.87
Unexpended balances of appropriations allowed to lapse—				
R.F. 2358 Johns Hopkins University	$235.45			
R.F. 2408 " " "	130.12			
R.F. 2409 " " "	761.38			
R.F. 2410 " " "	18.02			
R.F. 2417 " " "	12,966.58			
R.F. 2447 " " "	6,004.28			
R.F. 2448 " " "	1,225.67			
R.F. 2449 " " "	99.60	21,441.10	....	....
R.F. 2462 " " "		....	8,252.26	....
Net Totals		$282,143.13	$783,247.74	$323,374.87

EXHIBIT E

RESEARCH IN PHYSICS AND CHEMISTRY

		Prior Appropriations	1921 Appropriations	1921 Payments
National Research Council				
For the maintenance of a system of National Research Fellowships in physics and chemistry (R.F. 2431, 2517)		$65,816.50	$100,000.00	$49,806.53
For expenses of the Division of Physical Sciences (R.F. 2432, 2518)		7,258.84	15,000.00	10,767.35
Totals		$73,075.34	$115,000.00	$60,573.88
Unexpended balances of appropriations allowed to lapse—				
R.F. 2431	$65,816.50			
R.F. 2432	7,258.84	73,075.34	....	....
R.F. 2517		....	42,900.00	....
Net Totals		$........	$72,100.00	$60,573.88

EXHIBIT F

MENTAL HYGIENE

		Prior Appropriations	1921 Appropriations	1921 Payments
National Committee for Mental Hygiene				
For the work of the Committee in aiding State Commissions on Provision for the Mentally Defective (R.F. 2474, 2508)		$8,652.43	$40,000.00	$41,242.46
For studies in the psychopathology of crime (R.F. 2422, 2509)		2,856.75	3,500.00	3,197.61
For carrying out its surveys of the care and treatment of mental diseases (R.F. 2473, 2507)		7,160.22	35,000.00	22,169.98
For the Committee's work in establishing uniform statistics on mental diseases (R.F. 2423, 2510)		663.92	5,000.00	4,760.52
For administration expenses (R.F. 2511, 2512)		....	20,000.00	15,000.00
Totals		$19,333.32	$103,500.00	$86,370.57
Unexpended balances of appropriations allowed to lapse—				
R.F. 2473	$6,175.39			
R.F. 2474	2,788.44			
R.F. 2422	1,930.53			
R.F. 2423	63.81			
		10,958.17	....	....
R.F. 2512		....	5,000.00	....
Net Totals		$8,375.15	$98,500.00	$86,370.57

EXHIBIT G

HOSPITAL, DISPENSARY, AND NURSING STUDIES AND DEMONSTRATIONS

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
American Conference on Hospital Service			
Equipment and maintenance of library service bureau (R.F. 2472, 2595)	$12,000.00	$10,000.00	$15,000.00
Committee for the Study of Public Health Nursing			
For a study in the proper training of public health nurses (R.F. 2475)	23,642.25	....	21,491.32
Committee on Dispensary Development			
For maintenance of Service Bureau (R.F. 2481, 2514)	5,500.00	27,695.00	28,867.27
For study and experiment in the district dispensary field (R.F. 2575)	....	7,500.00	2,057.95
For the development of a demonstration dispensary in connection with the Presbyterian Hospital (R.F. 2558)	....	18,000.00	8,830.72
For the development of a demonstration dispensary in connection with Cornell Medical College Dispensary, $50,000 extending over the period July 1, 1921 to December 31, 1923 (R.F. 2573) (Instalment due 1921)	....	10,000.00	3,888.75
Committee on Training of Hospital Administrators			
For a study of hospital service (R.F. 2574)	....	15,000.00	1,926.83
Hospital and Dispensary Studies			
For expenses of studies (R.F. 2461, 2513)	983.89	4,500.00	2,408.39

Public Health Committee of the New York Academy of Medicine				
For a study of the dispensaries of New York City (R.F. 2399)		351.48	....	351.48
Study of Nurse Training in Europe				
For expenses of study (R.F. 2555)		....	10,000.00	....
TOTALS		$42,477.62	$102,695.00	$84,822.71
Unexpended balances of appropriations allowed to lapse				
Committee on Dispensary Development (R.F. 2481)	$180.84			
Hospital and Dispensary Studies (R.F. 2461)	983.89			
		1,164.73		
NET TOTALS		$41,312.89	$102,695.00	$84,822.71

EXHIBIT H

WAR WORK

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
American Social Hygiene Association			
For demonstration of social hygiene program in war camp community (R.F. 2330)	$18,495.28	$........	$1,793.75
National Research Council			
For special work of Division of Medicine and Related Sciences in connection with the war emergency and demobilization period (R.F. 2369)	7,736.08	....	500.00
Rockefeller Institute for Medical Research			
For war work during 1919 (R.F. 2388)	325.22	....	....
For additional equipment for teaching military and naval surgeons (R.F. 2230)	2,635.97	....	....
For the preparation of serums at Princeton Farm—1919 (R.F. 2394)	2,648.18	....	....
War Relief Commission			
Administration—1917 (R.F. 2216)	3,334.57	....	388.41
TOTALS	$35,175.30	$........	$2,682.16

Unexpended balances of appropriations allowed to lapse

American Social Hygiene Association (R.F. 2330)	$16,701.53
National Research Council (R.F. 2369)	7,236.08
Rockefeller Institute for Medical Research (R.F. 2388)	325.22
Rockefeller Institute for Medical Research (R.F. 2230)	2,635.97

Rockefeller Institute for Medical Research (R.F. 2394)	2,648.18			
War Relief Commission (R.F. 2216)	2,301.41			
		31,848.39		
NET TOTALS		$3,326.91	$........	$2,682.16
Refunds of amounts disbursed in previous years				
Rockefeller Institute for Medical Research—War work in 1919 (R.F. 2388)			$2,758.02	
Rockefeller Institute for Medical Research—Preparation of Serums (R.F. 2394)			1,482.01	
Yale University—Mobile Hospital Unit (R.F. 2243)			22,875.00	
			$27,115.03	

EXHIBIT I
MISCELLANEOUS

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
American Academy in Rome			
For general purposes, $10,000 a year for ten years beginning 1914 (R.F. 215) (Instalment due 1921)	$........	$10,000.00	$10,000.00
American Medical Association			
Toward the loss incurred in publishing a Spanish edition of the Journal of the American Medical Association in 1920 (R.F. 2545)	....	8,000.00	8,000.00
American Relief Administration			
Toward its work in feeding European children (R.F. 2533)	1,000,000.00	....	1,000,000.00
Committee of Reference and Counsel of the Annual Foreign Missions Conference of North America			
For carrying out its program of co-operation and co-ordination in foreign missionary work of the principal American Mission Boards. Total pledge of $425,000 extending over a period of ten years beginning 1914 (R.F. 228) (Instalment due 1921)	....	35,000.00	35,000.00
Common Service Committee			
Demonstration in centralized offices for health agencies (R.F. 2583)	....	25,000.00	19,304.38
Concilium Bibliographicum, Zürich, Switzerland			
For expenses during 1920 (R.F. 2463)	4,967.64	....	2,744.69
For expenses during 1921 (R.F. 2519)	....	12,500.00	2,866.72
Johns Hopkins University			
For study of fluke disease (R.F. 2568)	....	1,500.00	750.00

Med ical Centers of Europe			
For supplying the chief medical centers of Europe with important medical journals of America and England (R.F. 2494, 2584)	11,186.34	32,000.00	15,294.98
National Research Council			
For a study of biological abstracting and bibliography (R.F. 2561)	....	1,000.00	850.00
To bring to a satisfactory condition the buildings, equipment, and financial affairs of the Concilium Bibliographicum (R.F. 2609)	....	15,000.00	15,000.00
National Information Bureau			
For sustaining membership for the year 1921 (R.F. 2546)	....	1,000.00	1,000.00
New York Association for Improving the Condition of the Poor			
For providing pensions for dependent widows with families, $20,000 a year for ten years beginning 1914 (R.F. 239)			
(Balance of instalment due 1920)	10,000.00	....	10,000.00
(Instalment due 1921)	....	20,000.00	10,000.00
Rockefeller Institute for Medical Research			
For studies in animal nutrition (R.F. 2476)	5,000.00	....	5,000.00
Traveling expenses of George E. Vincent and Abraham Flexner			
Expenses in connection with their visit to Europe (R.F. 2536)	4,078.00	....	2,299.13
Grand Chenier Wild Life Refuge			
Taxes and expenses (R.F. 2433, 2548)	944.98	10,000.00	7,712.86
	$1,036,176.96	$171,000.00	$1,145,822.76
Asset Accounts			
Furniture and fixtures (R.F. 2524, 2566)	....	15,000.00	14,987.53
Books for the library (R.F. 2525)	....	700.00	681.39
TOTALS	$1,036,176.96	$186,700.00	$1,161,491.68

EXHIBIT I—*Continued*

		PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
Unexpended balances of appropriations allowed to lapse				
Traveling expenses of G. E. Vincent and Abraham Flexner (R.F. 2536)		$1,778.87	$........	$........
National Research Council (R.F. 2561)	$150.00			
Furniture and Fixtures (R.F. 2566)	12.47			
Books for Library (R.F. 2525)	18.61			
		....	181.08	....
NET TOTALS		$1,034,398.09	$186,518.92	$1,161,491.68
Administration				
Executive Offices (R.F. 2520, 2523, 2560, 2564, 2565)		$........	$183,950.00	$157,209.37
Treasurer's Office (R.F. 2521, 2522, 2547)		....	17,123.34	12,913.97
TOTALS		$........	$201,073.34	$170,123.34
Unexpended balances of appropriations allowed to lapse				
R.F. 2564	$18,749.36			
R.F. 2523	4,584.00			
R.F. 2565	1,879.14			
		....	25,212.50	....
NET TOTALS		$........	$175,860.84	$170,123.34

EXHIBIT J

1921 INTERNATIONAL HEALTH BOARD APPROPRIATIONS,*

UNPAID BALANCES OF APPROPRIATIONS MADE IN PREVIOUS YEARS, AND PAYMENTS THEREON MADE IN 1921

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
COUNTY HEALTH WORK			
Southern States			
Alabama			
1920—(I.H. 2655–60,2937)	$6,013.46	$........	$3,555.53
1921—(I.H. 21059–67, 21162–63, 21228–30)	....	23,750.00	10,453.31
Florida			
1921—(I.H. 21387)	....	262.50	....
Georgia			
1920—(I.H. 2661–6)	15,200.00	....	4,525.39
1921—(I.H. 21028)	....	5,000.00	....
Kansas			
1920—(I.H. 2906–7)	4,250.00	....	1,527.58
1921—(I.H. 21183–89, 21100, 21157)	....	8,183.32	3,056.42
Kentucky			
1920—(I.H. 2818, 2879, 2819–23, 21212, 2495)	11,575.55	1,777.46	6,080.81
1921—(I.H. 21084–90)	....	17,879.17	11,565.16
Louisiana			
1921—(I.H. 21179–81, 21223–25)	....	7,732.89	2,265.58
Maryland			
1921—(I.H. 21164)	....	4,351.67	....

*The Foundation provides for the cost of work carried on by the International Health Board by making to the Board one or more appropriations to cover its work during the year. From these large grants the Board then makes its own appropriations for specific objects.

EXHIBIT J—*Continued*

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
COUNTY HEALTH WORK—*Continued*			
Southern States—*Continued*			
Mississippi			
1920—(I.H. 2751–56, 2880–85)	$12,797.45	$........	$4,724.34
1921—(I.H. 21019–26, 21108)	....	22,900.00	7,368.77
Missouri			
1921—(I.H. 21194)	....	600.00	....
New Mexico			
1921—(I.H. 21068–70)	....	9,000.00	5,713.41
North Carolina			
1920—(I.H. 2824, 2825–32, 2838, 2871, 2872, 2904, 2938)	12,014.21	....	9,676.10
1921—(I.H. 21113–27)	....	14,916.67	6,824.85
South Carolina			
1920—(I.H. 2667–73, 2905)	6,051.17	....	5,015.15
1921—(I.H. 21034–40, 21136–43)	....	31,812.90	13,220.92
Tennessee			
1920—(I.H. 2674–78, 2944)	5,737.59	....	3,695.81
1921—(I.H. 21041–5, 21205, 21227)	....	15,612.50	11,147.61
Texas			
1920—(I.H. 2679–84)	4,662.79	....	3,686.78
1921—(I.H. 21093–98, 21219–22)	....	13,800.03	9,180.83
Virginia			
1920—(I.H. 2685–92, 2768, 21053–55)	16,488.03	....	6,472.41
1921—(I.H. 21079–83, 21128)	....	14,483.33	6,348.55
West Virginia			
1920—(I.H. 2769, 2898, 21017)	1,106.05	....	1,004.45
1921—(I.H. 21107, 21226, 21101–2, 21176–78)	....	9,567.06	2,288.92
Conference of Health Officers of the Southern States (I.H. 21047)	4,000.00	....	2,488.71

Hookworm Work			
Central America			
Costa Rica			
1920—(I.H. 2718, 2693)	9,314.01	....	633.13
1921—(I.H. 2969)	....	19,196.00	4,343.08
Guatemala			
1920—(I.H. 2694)	7,496.77	....	2,218.69
1921—(I.H. 2970)	....	19,440.00	10,173.56
Nicaragua			
1920—(I.H. 2725)	6,568.89	....	3,052.01
1921—(I.H. 2971)	....	11,000.00	7,282.97
Panama			
1920—(I.H. 2695)	5,766.06	....	1,210.06
1921—(I.H. 2972)	....	21,980.00	14,622.41
Salvador			
1920—(I.H. 2696)	6,885.86	....	2,130.76
1921—(I.H. 2973)	....	2,700.00	1,357.64
South America			
Brazil			
1920—(I.H. 2736, 2743–44, 2746, 2749, 2780–90, 2836, 2939, 2940, 21013, 21078, 2945, 21030, 21014, 56, 21215, 21233, 21246, 21361)	103,868.24	938.00	42,786.57
1921—(I.H. 2965, 2974–84, 21071, 21077–8, 21148, 9, 50)	....	234,257.09	96,754.67
British Guiana			
1920—(I.H. 2697)	9,497.68	....	403.38
1921—(I.H. 2989)	....	9,250.00	....
Colombia			
1920—(I.H. 2724, 2824)	16,030.54	....	452.04
1921—(I.H. 2985–7)	....	29,432.67	5,030.11
Dutch Guiana			
1920—(I.H. 2698)	368.00	....	200.00
1921—(I.H. 2990, 21217)	....	12,610.00	1,465.67

EXHIBIT J—*Continued*

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
Hookworm Work—*Continued*			
South America—*Continued*			
Ecuador			
1920—(I.H. 2727)	$6,000.00	$........	$........
West Indies			
Antigua			
1921—(I.H. 2988)	....	935.00	....
Grenada			
1920—(I.H. 2699)	7,791.00	....	....
1921—(I.H. 2991)	....	7,791.00	....
Jamaica			
1920—(I.H. 2700)	6,047.03	....	1,880.43
1921—(I.H. 2992)	....	16,000.00	7,392.06
Porto Rico			
1920—(I.H. 2805)	1,169.22	....	Cr. 57.59
1921—(I.H. 2993)	....	23,290.00	10,413.54
St. Lucia			
1920—(I.H. 2701)	2,067.65	....	1,641.29
1921—(I.H. 2995)	....	9,282.80	6,572.58
Santo Domingo			
1920—(I.H. 2806)	611.91	....	....
1921—(I.H. 2994)	....	23,290.00	....
Trinidad			
1920—(I.H. 2702)	5,737.26	....	3,403.96
1921—(I.H. 2996)	....	11,460.00	4,787.62

The East			
Australia			
1920—(I.H. 2729–34)	25,190.77	....	8,337.20
1921—(I.H. 21012)	....	18,500.00	5,304.31
British North Borneo			
1920—(I.H. 2941)	2,455.55	....	128.41
1921—(I.H. 21156)	....	5,745.00	660.18
British Solomon Islands			
1921—(I.H. 21133)	....	795.50	....
Ceylon			
1920—(I.H. 2771–74, 2776, 2910, 2775)	17,693.85	....	4,561.42
1921—(I.H. 2997–21000)	....	14,250.00	....
Egypt			
1915—(I.H. 237)	4,641.88	....	....
Fiji Islands			
1921—(I.H. 21355)	....	2,000.00	491.21
India			
1920—(I.H. 2942)	106.52	....	....
Mauritius			
1920—(I.H. 21129)	....	114.81	114.81
Siam			
1920—(I.H. 2779, 21146)	651.02	2,783.65	3,434.67
1921—(I.H. 21001)	....	9,271.00	7,997.04
Seychelles			
1920—(I.H. 2703)	6,604.50	....	....
Miscellaneous			
Research in Life History of Hookworm Eggs and Larvae (I.H. 2964)	....	3,631.40	3,556.90
Resurveys in Selected Counties in the Southern States (I.H. 2895, 21154, 21216, 2903)	460.51	18,000.00	14,423.31

EXHIBIT J—*Continued*

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
Hookworm Work—*Continued*			
Miscellaneous—*Continued*			
Study of the Various Methods of Diagnosis Used in Connection with Hookworm Disease (I.H. 21165)	$........	$1,500.00	$500.00
Portable House and Office at Salvador (I.H. 2449, 2614, 2839)	428.46	....	75.00
Malaria Work			
Southern States			
Alabama			
1920—(I.H. 2843–45)	5,114.50	....	4,523.35
1921—(I.H. 21145, 21196–97, 21158–59, 21210)	....	2,750.00	1,749.01
Arkansas			
1920—(I.H. 2888)	405.00	....	277.50
1921—(I.H. 21241)	....	1,477.85	....
Georgia			
1920—(I.H. 2889–91)	450.00	....	124.11
Louisiana			
1920—(I.H. 2794–97, 2837, 2846, 47, 49, 2886–87, 21031–32)	11,673.67	....	2,733.10
1921—(I.H. 21051, 21106, 21160, 21135)	....	15,680.05	8,196.61
Mississippi			
1920—(I.H. 2873–77, 2757, 2791–92, 2546)	17,116.87	....	3,931.82
1921—(I.H. 21027, 21111, 21192–3, 21134, 21112, 21198, 21209, 21240)	....	14,775.00	5,375.11
Missouri			
1921—(I.H. 21211)	....	833.33	....

North Carolina			
1920—(I.H. 2798–801)	9,013.50	....	6,004.51
1921—(I.H. 21110, 21152, 21239)	....	12,660.57	5,463.18
South Carolina			
1920—(I.H. 2760, 2762–63, 21050, 2936)	10,400.00	....	10,397.32
1921—(I.H. 21072–6, 21200–3, 21242–5)	....	18,022.50	....
Tennessee			
1920—(I.H. 2892–93)	2,717.00	....	....
1921—(I.H. 21161, 21175)	....	1,450.00	....
Texas			
1920—(I.H. 2850–55)	3,552.08	....	2,388.68
Virginia			
1920—(I.H. 2811–15)	4,350.00	....	1,501.27
1921—(I.H. 21199)	....	1,218.75	....
Malaria Control—Supervision (I.H. 2962)	....	50,000.00	....
Conference of Malaria Workers (I.H. 2948, 21238)	1,335.15	245.00	171.45
Co-operative Demonstration in Malaria Control—Home Office Fund (I.H. 2856)	352.37	....	228.16
Study to determine source of blood meals of Anopheles mosquitoes (I.H. 21213)	....	300.00	165.63
Central America			
Nicaragua			
1921—(I.H. 21174, 21057)	....	5,507.00	2,728.44
South America			
Argentina—Survey (I.H. 21046)	....	3,000.00	2,070.14
Ecuador			
1920—(I.H. 2726)	2,748.48	....	....

EXHIBIT J—*Continued*

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
MALARIA WORK—*Continued*			
West Indies			
Porto Rico			
1920—(I.H. 2807)	$1,258.32	$........	$607.78
1921—(I.H. 21191, 21109, 21018)	....	21,120.00	13,382.22
YELLOW FEVER			
Ecuador			
1920—(I.H. 2728)	6,270.10	....	1,381.09
1921—(I.H. 21204)	....	2,000.00	1,061.65
Mexico and Central America			
1920—(I.H. 2575)	609.29	....	....
1921—(I.H. 21058, 21360)	....	138,600.00	76,949.96
Peru			
1921—(I.H. 21354, 21103, 21131, 21155, 21208)	....	90,000.00	17,681.12
Epidemic Work			
1920—(I.H. 2909)	26,472.52	....	10,011.55
1921—(I.H. 21048)	....	3,000.00	2,605.05
Associates of Director—Salaries, Traveling Expenses, Equipment and Supplies			
1920—(I.H. 21016)	14,862.46	....	11,040.91
Brazil			
1921—(I.H. 21214)	....	1,000.00	....

Tuberculosis in France			
Central Administration			
1920—(I.H. 2706)	62,868.56	....	7,636.13
1921—(I.H. 21004, 21231)	....	108,057.00	73,274.03
Departmental Organization			
1920—(I.H. 2710)	103,913.81	....	93,615.57
1921—(I.H. 21008)	....	74,540.00	26,727.85
Educational Division			
1920—(I.H. 2709)	74,435.68	....	27,954.32
1921—(I.H. 21007, 21232)	....	109,484.20	66,824.56
Medical Division			
1920—(I.H. 2707)	106,005.23	....	16,431.31
1921—(I.H. 21005)	....	78,212.00	33,452.18
Public Health Visiting			
1920—(I.H. 2708)	155,501.27	....	11,758.73
1921—(I.H. 21006)	....	149,272.40	80,526.57
Public Health Administration			
1921—(I.H. 21009)	....	50,000.00	....
Contingent Fund			
1921—(I.H. 2963)	....	10,000.00	750.00
Public Health Education			
Brasil			
São Paulo—Department of Hygiene			
1920—(I.H. 2704, 21362)	3,420.39	1,629.49	5,049.88
1921—(I.H. 21002, 21132)	....	21,000.00	15,706.51

EXHIBIT J—*Continued*

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
PUBLIC HEALTH EDUCATION—*Continued*			
Czechoslovakia			
Institute of Public Health (I.H. 21207, 21391)	$........	$250,000.00	$........
Fellowships			
Grants to doctors for study of public health (I.H. 2958–60, 21403–4, 21130)	....	120,400.00	58,956.24
Public Health Institutes			
Alabama—Birmingham—(I.H. 21374)	....	175.00	....
Georgia—(I.H. 21092)	....	550.00	462.50
New York—Albany—(I.H. 21363)	....	368.00	....
N. Y. City—(I.H. 21147)	....	1,075.00	1,075.00
Syracuse—(I.H. 21195)	....	660.00	656.77
Michigan—Lansing—(I.H. 21357)	....	595.82	595.82
Ohio—Columbus—(I.H. 21237)	....	193.81	193.81
Health Officers' Correspondence Study Course—Ohio (I.H. 21375)	....	125.00	....
Public Health Laboratory Service			
United States			
Kansas—(I.H. 21099, 21182, 2896)	979.17	4,500.00	2,175.54
Foreign			
Guatemala—(I.H. 21235)	....	1,500.00	10.08
Nicaragua—(I.H. 21236)	....	1,050.00	....
Salvador—(I.H. 21234)	....	1,500.00	....
Demonstrations—(I.H. 21144)	....	300.00	9.00

Administrative Field Staff			
Salaries—(I.H. 2644, 2949)	94,857.74	300,000.00	271,678.61
Traveling expenses—(I.H. 2951, 2646)	13,084.93	90,000.00	84,565.48
Commutation (I.H. 2645, 2950)	38,684.78	60,000.00	34,502.16
Medical examinations (I.H. 2955)	....	700.00	371.60
Drugs for conserving health (I.H. 2954)	....	1,000.00	....
Bonding—(I.H. 21091)	....	5,000.00	2,671.91
Traveling expenses of families (I.H. 2647, 2952, 21153)	145.38	11,000.00	5,040.95
Study leave—(I.H. 2953)	....	1,000.00	86.66
Tuition—Staff members in training—(I.H. 2956)	....	500.00	201.67
Automobiles for directors in training—(I.H. 2957)	....	3,000.00	618.39
Miscellaneous			
Czechoslovakia			
Public health work—(I.H. 2935, 2961)	26,757.64	26,500.00	22,836.35
Express, freight, and exchange (I.H. 2967)	....	25,000.00	....
Field equipment and supplies (I.H. 2966)	....	10,000.00	4,982.25
Expenses of Dr. F. C. Yen in connection with the compilation of a mining sanitary code (I.H. 21373)	....	140.00	125.98
Motion picture film on hookworm disease—(I.H. 2835, 2947)	1,982.27	....	1,584.74
Massachusetts public health survey—(I.H. 2767)	7.49	....	.85
Pamphlets and charts (I.H. 2968, 21359)	....	18,000.00	10,153.44
Study of teaching of hygiene (I.H. 21011)	465.31	....	......
Survey and exhibits—(I.H. 21003)	....	25,080.00	13,437.76
Training of British bacteriologist in the Noguchi yellow fever technique—(I.H. 2817)	2,000.00	....	....
Expenses in connection with visit to the United States of Brazilian scientists—(I.H. 21104, 21206, 21105)	....	7,800.00	7,498.39
Administration—(I.H. 21010, 21151, 21190)	....	140,086.00	122,990.56
Totals Carried Forward	$1,157,160.44	$2,824,707.19	$1,721,563.36

EXHIBIT J—*Continued*

		PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
MISCELLANEOUS—*Continued*				
TOTALS BROUGHT FORWARD		$1,157,160.44	$2,824,707.19	$1,721,563.36
Appropriations for expenditures made in certain foreign countries are based on fixed rates of exchange. This amount represents the difference between the cost at the fixed rate and the actual cost of such exchange items		....	....	92,311.22
Unexpended balances of appropriations allowed to lapse—				
Prior Year		773,012.89	....	....
1921	$393,988.72			
Difference in exchange as above	92,311.22	....	486,299.94	....
NET TOTALS*		$384,147.55	$2,338,407.25	$1,629,252.14
Refund on prior year appropriation—				
China (I.H. 2549)	$2,534.15			

*The Foundation appropriated to the International Health Board for its work during the year 1921 the sum of $2,500,000.

EXHIBIT K

1921 CHINA MEDICAL BOARD APPROPRIATIONS,*

UNPAID BALANCES OF APPROPRIATIONS MADE IN PREVIOUS YEARS, AND PAYMENTS THEREON DURING THE YEAR 1921

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
HOSPITALS OF MISSIONARY SOCIETIES			
American Baptist Foreign Mission Society			
Ningpo—salaries of doctor and nurse, $2,250 a year for five years beginning 1920 (C.M. 276)			
(Instalment for 1920)	$2,250.00	$........	$........
(Instalment for 1921)	....	2,250.00	....
Shaohsing—Support of foreign nurse, Chinese manager, and foreign doctor, $2,475 a year for five years beginning 1920 (C.M. 277)			
(Instalment for 1920)	2,475.00	....	750.00
(Instalment for 1921)	....	2,475.00	....
Shaohsing—equipment and residences for physician, nurse, and Chinese staff (C.M. 278, 2319)	5,625.00	....	....
American Board of Commissioners for Foreign Missions			
Fenchow—Buildings and equipment (C.M. 2517)	....	15,000.00	15,000.00
Fenchow—Buildings and equipment. Mex. 6,250.00 (C.M. 2518)	....	4,000.00	....
Fenchow—Salaries of additional staff, $3,700 a year for five years beginning 1921 (C.M. 2519)			
(Instalment due 1921)	....	3,700.00	....
Fenchow—Current expenses, Mex. 2,500 a year for five years beginning 1921 (C.M. 2520)			
(Instalment due 1921)	....	1,500.00	....

* The Foundation provides for the cost of work carried on by the China Medical Board by making to the Board one or more appropriations to cover its work for the year. From these large grants the Board then makes its own appropriations for specific objects.

EXHIBIT J—*Continued*

		PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
MISCELLANEOUS—*Continued*				
TOTALS BROUGHT FORWARD		$1,157,160.44	$2,824,707.19	$1,721,563.36
Appropriations for expenditures made in certain foreign countries are based on fixed rates of exchange. This amount represents the difference between the cost at the fixed rate and the actual cost of such exchange items		....	....	92,311.22
Unexpended balances of appropriations allowed to lapse—				
Prior Year		773,012.89	....	....
1921	$393,988.72			
Difference in exchange as above	92,311.22	....	486,299.94	....
NET TOTALS*		$384,147.55	$2,338,407.25	$1,629,252.14
Refund on prior year appropriation—				
China (I.H. 2549)	$2,534.15			

*The Foundation appropriated to the International Health Board for its work during the year 1921 the sum of $2,500,000.

EXHIBIT K

1921 CHINA MEDICAL BOARD APPROPRIATIONS,*

UNPAID BALANCES OF APPROPRIATIONS MADE IN PREVIOUS YEARS, AND PAYMENTS THEREON DURING THE YEAR 1921

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
HOSPITALS OF MISSIONARY SOCIETIES			
American Baptist Foreign Mission Society			
Ningpo—salaries of doctor and nurse, $2,250 a year for five years beginning 1920 (C.M. 276)			
(Instalment for 1920)	$2,250.00	$........	$........
(Instalment for 1921)	....	2,250.00	....
Shaohsing—Support of foreign nurse, Chinese manager, and foreign doctor, $2,475 a year for five years beginning 1920 (C.M. 277)			
(Instalment for 1920)	2,475.00	....	750.00
(Instalment for 1921)	....	2,475.00	....
Shaohsing—equipment and residences for physician, nurse, and Chinese staff (C.M. 278, 2319)	5,625.00	....	....
American Board of Commissioners for Foreign Missions			
Fenchow—Buildings and equipment (C.M. 2517)	....	15,000.00	15,000.00
Fenchow—Buildings and equipment. Mex. 6,250.00 (C.M. 2518)	....	4,000.00	....
Fenchow—Salaries of additional staff, $3,700 a year for five years beginning 1921 (C.M. 2519)			
(Instalment due 1921)	....	3,700.00	....
Fenchow—Current expenses, Mex. 2,500 a year for five years beginning 1921 (C.M. 2520)			
(Instalment due 1921)	....	1,500.00	....

* The Foundation provides for the cost of work carried on by the China Medical Board by making to the Board one or more appropriations to cover its work for the year. From these large grants the Board then makes its own appropriations for specific objects.

EXHIBIT K—*Continued*

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
HOSPITALS OF MISSIONARY SOCIETIES—*Continued*			
American Board of Commissioners for Foreign Missions—*Continued*			
Tehchow—Salary of two doctors, $3,236 a year for five years beginning 1915 (C.M. 211, 294)			
(Balance due on instalments)	$11,796.60	$........	$........
Tehchow—Employes' salaries, $4,152 a year for five years beginning 1916 (C.M. 297, 2229)			
(Balance due on instalments)	7,634.25	....	3,593.50
Tehchow—Salary of business manager, $3,525.88 extending over a period of four years beginning 1918 (C.M. 2360)			
(Balance due on previous instalments)	712.70	....	712.70
(Instalment due 1921)	....	950.25	237.55
Tehchow—Toward cost of an electric lighting plant (C.M. 2497)	....	1,000.00	1,000.00
Tehchow—Support of successor to Dr. Lee M. Miles, $1,091 a year for five years beginning 1921. To cover one half of loss on exchange $2,545. (C.M. 2498)			
(Instalment due 1921)	....	3,636.00	....
Board of Foreign Missions of the Methodist Episcopal Church			
Peking—Salary of doctor, $2,400 a year for five years beginning 1916 (C.M. 223, 2102)			
(Balance due on instalments)	8,800.00	....	....
Peking—Support of dentist, medical practitioner, and nurse, $22,500 extending over a period of five years beginning 1920 (C.M. 2266)			
(Instalment due 1920)	6,000.00	....	6,000.00
(Instalment due 1921)	....	5,250.00	5,250.00
Peking—Support of two dentists, $2,400 a year for five years beginning 1921 (C.M. 2522)			
(Instalment due 1921)	....	2,400.00	....

Peking—Residences for two dentists (C.M. 2523)	....	8,000.00	....
Peking—Initial equipment for dental department (C.M. 2540)	....	10,000.00	....
Wuhu—Salary and allowance of doctor, $900 a year for five years beginning with 1916 (C.M. 283, 2176)			
(Balance due on instalments)	2,100.00	....	....
Wuhu—Building of hospital and residences (C.M. 2384)	40,000.00	....	....
Wuhu—Salaries of additional staff and maintenance expenses, $7,250 a year for five years beginning 1920 (C.M. 2385)			
(Instalment due 1920)	7,250.00	....	4,125.00
(Instalment due 1921)	....	7,250.00	....
Wuhu—Buildings and equipment (C.M. 2499)	....	30,000.00	....
Board of Missions of the Methodist Episcopal Church, South			
Soochow—Salary of nurse, $600 a year for five years beginning 1916 (C.M. 236, 2105)			
(Balance due on instalments)	1,800.00	....	....
Soochow—Buildings and equipment, Mex. 50,000 (C.M. 2417, 2500)	12,500.00	30,000.00	13,514.15
Soochow—Maintenance of additional foreign staff, Mex. 8,000 a year for five years beginning 1920 (C.M. 2418).			
(Instalment due 1920)	9,500.00	....	....
(Instalment due 1921)	....	9,500.00	....
Board of Missions of the Methodist Episcopal Church, South—American Baptist Foreign Mission Society, Jointly			
Huchow—Building and equipment (C.M. 2151)	20,000.00	....	10,000.00
Huchow—Support of foreign physician, $5,025 extending over a period of five years beginning 1920 (C.M. 2152)			
(Instalment due 1920)	1,650.00	....	....
(Instalment due 1921)	....	825.00	....
Huchow—Support of foreign nurse, $3,000 extending over a period of five years beginning 1920 (C.M. 2153)			
(Instalment due 1920)	825.00	....	....
(Instalment due 1921)	....	450.00	....

EXHIBIT K—*Continued*

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
HOSPITALS OF MISSIONARY SOCIETIES—*Continued*			
Board of Missions of the Methodist Episcopal Church, South—American Baptist Foreign Mission Society, Jointly—*Continued*			
Huchow—Support of Chinese physician, $2,250 extending over a period of five years beginning 1920 (C.M. 2154)			
(Instalment due 1920)	$450.00	$........	$........
(Instalment due 1921)	....	450.00	....
Board of Foreign Missions of the Presbyterian Church in the U. S. A.			
Changteh—Current expenses, $2,625 a year for five years beginning 1916 (C.M. 2144)			
(Balance due on instalments)	8,193.75	....	1,725.00
Changteh—Current expenses, $2,250 a year for five years beginning 1918 (C.M. 2318)			
(Instalment due 1920)	2,250.00	....	2,250.00
(Instalment due 1921)	....	2,250.00	2,250.00
Chefoo—Salary and allowance of doctor and nurse, $2,625 a year for five years beginning 1917 (C.M. 284)			
(Balance due on previous instalments)	8,433.80	....	1,247.50
(Instalment due 1921)	....	2,625.00	....
Chefoo—Operating expenses, $2,250 a year for five years beginning 1918 (C.M. 2243)			
(Instalment due 1921)	....	2,250.00	2,250.00
Chefoo—New boiler for heating plant (C.M. 2515)	....	1,500.00	1,500.00
Hwaiyuen—Salary and allowance of physician and nurse and operating expenses, $3,375 a year for five years beginning 1919 (C.M. 285)			
(Balance due on previous instalments)	6,000.00	....	1,650.00
(Instalment due 1921)	....	3,375.00	....

Hwaiyuen—Residence of doctor and equipment (C.M. 286)	2,250.00	....	....
Paotingfu—Salaries of doctor and two nurses. Shuntehfu—Salaries of doctor and two nurses, $9,200 a year for five years beginning 1916. (C.M. 214, 295)			
(Balance due on instalments)	18,075.00	....	4,050.00
Paotingfu—Support of business manager, $900 a year for four years beginning 1918 (C.M. 2306)			
(Instalment due 1920)	900.00	....	900.00
(Instalment due 1921)	....	900.00	....
Shuntehfu—Maintenance, $750 a year for five years beginning 1916 (C.M. 2142)			
(Balance due on instalments)	1,187.50	....	750.00
Board of Foreign Missions of the Reformed Church in America			
Hope and Wilhelmina Hospital—Purchase of pump, well, engine, and electric light plant (C.M. 2282)	2,025.00	....	....
Hope and Wilhelmina Hospital—Support of physician, $1,881 a year for five years beginning 1920 (C.M. 2283)			
(Instalment due 1920)	1,881.00	....	....
(Instalment due 1921)	....	1,881.00	....
Canton Christian College			
Canton—Salary of business manager and current expenses, $4,500 a year for five years beginning 1917 (C.M. 2139)			
(Instalment due 1921)	....	4,500.00	4,500.00
Canton—Current expenses 1921–22, Mex. 9,000 (C.M. 2541)	....	5,500.00	....
Church of Scotland Foreign Mission Committee			
Ichang—Support of third foreign doctor and nurse, $2,250 a year for five years beginning 1920 (C.M. 289)			
(Balance of instalment due 1920)	1,500.00	....	....
(Instalment due 1921)	....	2,250.00	....

EXHIBIT K—*Continued*

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
HOSPITALS OF MISSIONARY SOCIETIES—*Continued*			
Domestic and Foreign Mission Society of the Protestant Episcopal Church in the U. S. A.			
Anking—Operating expenses, $4,200 a year for five years beginning 1919 (C.M. 2308)			
(Balance due on previous instalments)	$3,825.00	$........	$2,475.00
(Instalment due 1921)	....	4,200.00	1,950.00
Anking—Residence of physician, Mex. 6,000 (C.M. 2361)	5,500.00	....	3,257.44
Executive Committee of Foreign Missions of the Presbyterian Church in the U. S., South			
Soochow—Salary, outfit, and travel to field, of foreign nurse; Kashing—Salary, outfit, and travel to field, of foreign nurse. Salaries, $3,600 a year for five years beginning 1915 (C.M. 221, 2101)			
(Balance due on instalments)	13,625.00	....	....
Foreign Christian Missionary Society			
Luchowfu—Buildings and fixed equipment (C.M. 2327)	500.00	....	....
Luchowfu—Movable equipment (C.M. 2328)	4,800.00	....	....
Luchowfu—Maintenance $4,100 a year for five years beginning 1920 (C.M. 2329)			
(Instalment due 1920)	4,100.00	....	....
(Instalment due 1921)	....	4,100.00	....
Luchowfu—Salary of second foreign nurse, $1,400 a year for five years beginning 1920 (C.M. 2330)			
(Instalment due 1920)	1,400.00	....	....
(Instalment due 1921)	....	1,400.00	....
Luchowfu—Salary of business manager, $1,400 a year for five years beginning 1920 (C.M. 2331)			

(Instalment due 1920)	1,400.00	....	....
(Instalment due 1921)	....	1,400.00	....
Luchowfu—Salary and allowance of doctor and nurse; Nantungchow—Salary and allowance of nurse, $4,200 a year for five years beginning 1918 (C.M. 215, 2100)			
(Balance due on previous instalments)	9,405.00	....	....
(Instalment due 1921)	....	4,200.00	....
Nantungchow—Support of second physician, $8,400 extending over a period of five years beginning 1920 (C.M. 2218)			
(Instalment due 1920)	1,800.00	....	....
(Instalment due 1921)	....	1,650.00	....
Foreign Mission Board of the Southern Baptist Convention			
Chengchow—Salary of doctor, $1,200 a year for five years beginning 1916 (C.M. 228, 2106)			
(Balance due on instalments)	3,250.00	....	....
Hwanghien—Salary of physician, $900 a year for five years beginning 1920 (C.M. 281)			
(Instalment due 1920)	900.00	....	....
(Instalment due 1921)	....	900.00	....
Hwanghien—Outfit and travel of physician (C.M. 282)	750.00	....	....
Hwanghien—Salary of nurse, $600 a year for five years beginning 1916 (C.M. 225, 2103)			
(Balance due on instalments)	1,500.00	....	....
Laichowfu—Equipment and outgoing expenses of physician and wife (C.M. 280)	750.00	....	....
Laichowfu—Salary of physician and wife and nurse, $1,650 a year for five years beginning 1920 (C.M. 279)			
(Instalment due 1920)	1,650.00	....	....
(Instalment due 1921)	....	1,650.00	....
Yangchow—Salary of nurse, $600 a year for five years beginning 1916 (C.M. 232, 2104)			
(Balance due on instalments)	1,625.00	....	....

EXHIBIT K—*Continued*

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
HOSPITALS OF MISSIONARY SOCIETIES—*Continued*			
Foreign Mission Board of the Southern Baptist Convention—*Continued*			
Yangchow—Maintenance Mex. 2,000 a year for five years beginning 1921 (C.M. 2525)			
(Instalment due 1921)	$........	$1,000.00	$........
London Missionary Society			
Siaochang—Support of nurse, $600 a year for five years beginning 1920 (C.M. 2167)			
(Instalment due 1920)	600.00	....	....
(Instalment due 1921)	....	600.00	....
Tsangchow—Support of nurse, $750 a year for five years beginning 1918 (C.M. 2326)			
(Balance due on previous instalments)	1,500.00	....	....
(Instalment due 1921)	....	750.00	....
Medical Mission Auxiliary of London			
Tai Yuan Fu—Improvements and supplies (C.M. 2201)	1,702.22	....	....
United Free Church of Scotland			
Mukden—Support of nurse, $750 a year for five years beginning 1918 (C.M. 2232)			
(Balance due on previous instalments)	1,500.00	....	750.00
(Instalment due 1921)	....	750.00	....
University of Nanking			
Nanking—Current expenses, $9,250 a year for five years beginning 1917 (C.M. 2137)			
(Balance due on previous instalments)	18,500.00	....	9,250.00
(Instalment due 1921)	....	9,250.00	....

Women's Foreign Missionary Society of the Methodist Episcopal Church			
Kiukiang—Salary of nurse, $500 a year for five years beginning 1919 (C.M. 2359)			
(Instalment due 1920)	500.00	....	....
(Instalment due 1921)	....	500.00	....
Loss in Exchange			
To cover loss in exchange on payments to missionary societies for their hospitals (C. M. 2503)	....	150,000.00	20,076.59
Emergency Fund			
For aid of medical work in China, at the discretion of the resident director (C.M. 2456, 2512)	1,850.13	2,000.00	2,971.46
MISSIONARY SOCIETIES—HOSPITALS AND PRE-MEDICAL EDUCATION			
Yale Foreign Missionary Society			
Hunan-Yale Medical School, Changsha—Salaries and expenses of staff of hospital, pre-medical school, and nurses' training school, Mex. 41,605 per year for five years beginning July 1, 1920 (C.M. 2454)			
(Instalment due 1920)	25,000.00	....	22,778.24
(Instalment due 1921)	....	50,000.00	....
Hunan-Yale Medical School, Changsha—Salaries and expenses of staff of hospital, pre-medical school, and nurses' training school, $6,645 a year for five years beginning July 1, 1920 (C.M. 2455)			
(Instalment due 1920)	6,645.00	....	6,645.00
(Instalment due 1921)	....	6,645.00	....
HOSPITALS UNDER CHINESE MANAGEMENT			
Central Hospital, Peking			
Salaries of Chinese doctor and nurse, $5,000 a year for three years beginning 1920 (C.M. 2464)			
(Balance of instalment due 1920)	2,500.00	....	....
(Instalment due 1921)	....	5,000.00	....

EXHIBIT K—*Continued*

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
MEDICAL EDUCATION			
Medical Schools Affiliated			
Peking Union Medical College Asset Accounts			
Purchase of additional property (C.M. 213, 248, 249, 2170, 2213, 2381)	$76,414.87	$........	$28,263.70
Buildings and fixed equipment (C.M. 2492, 2495)	355,631.80	350,000.00	647,311.75
Alterations to original buildings (C.M. 2407, 2537)	23,434.70	125,000.00	23,534.45
Street Improvements (C.M. 2408)	9,000.00	....	5,020.52
Movable Equipment (C.M. 2409)	213,356.96	....	169,259.75
Accessories (C.M. 2410, 2496, 2516, 2529, 2544)	216,742.96	90,000.00	234,809.92
Heavy furniture for staff residences (C.M. 2378)	8,179.18	....	37.56
Library (C.M. 2440)	15,350.45	....	6,735.71
Operation			
Budget 1919–20 (C.M. 2493)	717.95	....	Cr. 1,577.39
Budget 1920–21 (C.M. 2441)	234,745.95	350,000.00	358,255.38
Budget 1921–22 (C.M. 2524, 2535)	....	300,000.00	11,152.80
Peking American School (C.M. 2501)	....	50,000.00	....
Diet investigation work (C.M. 2539)	....	7,500.00	....
Expenses of visiting professors (C.M. 2538)	....	10,000.00	....
Travel and expenses of trustees in attending dedication of College (C.M. 2494)	....	50,000.00	11,110.03
Insurance (C. M. 2514)	....	17,000.00	10,693.92
Contingent Fund (C.M. 2536)	....	20,000.00	....
Expenses in America			
Year 1920–21 (C.M. 2481, 2475)	4,492.50	5,000.00	3,415.96
Year 1921–22 (C.M. 2534)	....	5,000.00	298.67
Shanghai Medical School Asset Accounts			
Purchase of land (C.M. 2269, 2429)	74,415.26	....	20,906.80

Buildings and fixed equipment (C.M. 2413)	48,977.03	....	20,823.27
Accessories (C.M. 2272)	4,960.24	....	....
Library (C.M. 2215)	2,328.95	....	Cr. 671.05
Operation			
Budget 1918–19 (C.M. 2277)	4,230.48	....	....
Medical Schools—Unaffiliated			
Shantung Christian University Medical School			
To cover loss in exchange in connection with appropriations (C.M. 251, 252, 2217, 2358)	18,236.55	....	7,908.60
Toward its general budget for the year 1921–22, Mex. 33,000. (C.M. 2531, 2551)	....	19,382.16	19,382.16
Yale Foreign Missionary Society			
Hunan-Yale Medical School, Changsha—Heating plant for laboratory building (C.M. 2527)	....	3,400.00	....
Pre-Medical Education			
Canton Christian College			
Equipment (C.M. 2443)	10,000.00	....	....
Salaries of two professors and one instructor, Mex. 10,200 a year for five years beginning 1920 (C.M. 2445)			
(Instalment due 1921)	....	12,000.00	5,610.00
Fukien Christian University			
Building and equipment for science department (C.M. 2273)	22,916.00	....	22,916.00
Salaries of six instructors, $10,000 a year for five years beginning 1919 (C.M. 2274)			
(Instalment due 1921)	....	10,000.00	10,000.00
Salaries of Chinese instructors, $2,700 a year for five years beginning 1919 (C.M. 2275)			
(Instalment due 1921)	....	2,700.00	2,700.00
Maintenance of science department, $10,000 a year for five years beginning 1919 (C.M. 2276)			
(Instalment due 1921)	....	10,000.00	10,000.00

EXHIBIT K—*Continued*

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
PRE-MEDICAL EDUCATION—*Continued*			
Ginling College			
Salary of teacher of physics, $2,400 a year for five years beginning 1920 (C.M. 2402)			
(Instalment due 1920)	$2,400.00	$........	$2,064.00
(Instalment due 1921)	....	2,400.00	1,236.00
Scientific equipment (C.M. 2403)	5,000.00	....	5,000.00
St. John's University, Shanghai			
Maintenance expenses, $18,800 extending over a period of four years beginning 1920 (C.M. 2415)			
(Instalment due 1921)	....	6,300.00	6,300.00
Books and periodicals (C.M. 2543)	....	879.50	879.50
Support of instructor, 1921–22 (C.M. 2528)	....	1,500.00	1,500.00
TRANSLATION			
China Medical Missionary Association—Publication Committee			
For use in translation work, Mex. 10,000 a year for two years beginning 1919 (C.M. 2423)			
(Instalment due 1920)	12,000.00	....	6,117.82
For use in translation work, Mex. 8,000 a year for two years beginning 1921 (C.M. 2532)			
(Instalment due 1921)	....	5,000.00	....
National Medical Association of China			
For expenses connected with their participation in the terminology committee, Mex. 500 a year for five years beginning 1920 (C.M. 2453)			
(Instalment due 1921)	....	600.00	250.87
FELLOWSHIPS AND SCHOLARSHIPS			
C.M. 2504, 2505, 2510	....	44,150.00	27,422.82

Miscellaneous			
Committee of Reference and Counsel of the Foreign Missions Conference of North America			
Toward expenses of survey of education under missionary auspices in China (C.M. 2533)	....	8,000.00	....
Model System of Mission Hospital Accounting			
For purchase of ledgers, forms, etc. (C.M. 2509)	....	2,000.00	2,000.00
North China Union Language School			
Toward cost of recitation building and library, Mex. 40,000 (C.M. 2502)	....	45,000.00	....
Repairs and equipment, Mex. 5,000 (C.M. 2513)	....	3,000.00	2,286.30
National Medical School, Peking			
Toward purchase of new site, Mex. 12,000 (C.M. 2526)	....	6,000.00	5,487.09
Famine Relief			
Sanitary work in connection with the Chinese famine relief (C.M. 2508)	....	10,000.00	....
Studies of Pre-Medical Education			
For studies in and about Peking (C.M. 2511)	....	500.00	....
Administration			
Home Office	....	99,599.00	93,293.99
Peking Office	19,894.38	33,267.00	20,304.43
Totals	$1,694,568.16	$2,116,839.91	$1,955,450.46
Unexpended balances of appropriations allowed to lapse	41,694.02	262,193.77	
Net Totals*	$1,652,874.14	$1,854,646.14	$1,955,450.46
Refunds on appropriations—			
Peking Union Medical College—Original property (C.M. 212)		$7,759.48	
Peking Union Medical College—Property of Prince Yu (C.M. 239)		16,144.64	
Harvard Medical School of China (C.M. 227)		28,800.00	
		$52,704.12	

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*The Foundation appropriated to the China Medical Board for its work during the year 1921 the sum of $2,115,787.00.

EXHIBIT L

SUMMARY OF APPROPRIATIONS AND PAYMENTS

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
International Health Board	$384,147.55	$2,338,407.25	$1,629,252.14
China Medical Board	1,652,874.14	1,854,646.14	1,955,450.46
Medical Education	144,218.74	2,500,583.71	2,156,216.68
Schools of Hygiene and Public Health	282,143.13	783,247.74	323,374.87
Research in Physics and Chemistry	....	72,100.00	60,573.88
Mental Hygiene	8,375.15	98,500.00	86,370.57
Hospital, Dispensary, and Nursing Studies and Demonstrations	41,312.89	102,695.00	84,822.71
War Work	3,326.91	....	2,682.16
Miscellaneous	1,034,398.09	186,518.92	1,161,491.68
Administration	....	175,860.84	170,123.34
Totals	$3,550,796.60	$8,112,559.60	$7,630,358.49

Prior Appropriations	$3,550,796.60		
1921 Appropriations	8,112,559.60		
Total Appropriations		$11,663,356.20	
1921 Payments		7,630,358.49	
Balance payable on Appropriations			$4,032,997.71

In addition to the foregoing, the Foundation has made pledges and appropriations which become effective in future years. These will require for payment the following amounts:

YEAR 1922		
International Health Board	$2,500,000.00	
China Medical Board	1,200,000.00	
Medical Education	1,640,608.00	
Mental Hygiene	64,500.00	
Research in Physics and Chemistry	100,000.00	
Schools of Hygiene and Public Health	275,000.00	
Miscellaneous	500,638.40	
		$6,280,746.40
YEAR 1923		4,619,892.00
YEAR 1924		3,460,067.00
YEAR 1925		2,596,191.00
YEAR 1926		2,229,500.00
		$19,186,396.40

EXHIBIT M

STATEMENT OF APPROPRIATIONS AND PAYMENTS OF SPECIAL FUNDS DURING THE YEAR 1921

	PRIOR APPROPRIATIONS	1921 APPROPRIATIONS	1921 PAYMENTS
Estate of Laura S. Rockefeller Fund			
Fifth Avenue Baptist Church (R.F. 2454)	$28,688.86	$........	$28,688.86
Laura S. Rockefeller Fund			
Baptist Home for the Aged of New York City (R.F. 2529)		$500.00	$500.00
Baptist Home of Northern Ohio (R.F. 2527)		500.00	500.00
Euclid Avenue Baptist Church of Cleveland, Ohio (R.F. 2528)		1,500.00	1,500.00
Ministers and Missionaries Benefit Board of the Northern Baptist Convention (R.F. 2526)		500.00	500.00
		$3,000.00	$3,000.00
John D. Rockefeller Fund			
Baptist Home for the Aged of New York City (R.F. 2530, 2531)		$1,850.00	$1,850.00

EXHIBIT N

STATEMENTS OF PRINCIPAL FUNDS

General Fund

Balance of Mr. Rockefeller's gifts December 31, 1921	$171,204,624.50

The whole fund is invested in securities.

Reserve

Balance December 31, 1920	$3,111,288.56
Gain on securities sold and redeemed during the period January 1, 1921–December 31, 1921 (Exhibit P)	63,169.24
Gain on sale of land in China	16,075.20
Total	$3,190,533.00

The whole fund is invested in securities.

Laura S. Rockefeller Funds

Gifts comprising four separate funds	$49,300.00

The total of these funds is invested in securities.

John D. Rockefeller Fund

Gifts	$37,000.00

The whole fund is invested in securities.

Henry Sturgis Grew Memorial Fund

Gift to Harvard Medical School of China transferred to the Foundation in trust	$25,000.00

The whole fund is invested in securities.

Arthur Theodore Lyman Endowment

Amount received from Harvard Medical School of China and held as a principal fund for Shanghai Medical School	$5,500.00

The whole fund is invested in securities.

EXHIBIT O

LAND, BUILDINGS, AND EQUIPMENT FUNDS

		NET EXPENDITURES TO DECEMBER 31, 1920	EXPENDITURES 1921	DECEMBER 31, 1921
THE ROCKEFELLER FOUNDATION				
Library		$2,561.56	$681.39	$3,242.95
Equipment	$21,769.19			
Less depreciation	5,019.72			
		16,749.47	14,987.53	31,737.00
NET TOTALS, The Rockefeller Foundation		$19,311.03	$15,668.92	$34,979.95
CHINA MEDICAL BOARD				
Peking Union Medical College:				
Original purchase	$178,772.77			
Less refund on account building material	7,759.48			
		$171,013.29	$........	$171,013.29
Additional land		190,026.40	12,119.06	202,145.46
New buildings		6,278,603.16	647,311.75	6,925,914.91
Alterations—original buildings		98,765.30	23,534.45	122,299.75
Movable equipment		210,643.04	169,259.75	379,902.79
Accessories		164,257.04	234,809.92	399,066.96
Heavy furniture for staff residences		6,820.82	37.56	6,858.38
Library		64,649.55	6,735.71	71,385.26
Street improvements		....	5,020.52	5,020.52

Shanghai Medical School:				
Land		270,584.74	20,906.80	291,491.54
New buildings		35,831.27	20,823.27	56,654.54
Movable equipment		39.76	....	39.76
Accessories		39.76	....	39.76
Library	$671.05			
Less donations to universities	671.05			
		....	....	....
Harvard Medical School	$28,800.00			
Less purchase price more than realized at sale of property	28,800.00			
		....	....	....
NET TOTALS, China Medical Board		$7,491,274.13	$1,140,558.79	$8,631,832.92
NET GRAND TOTALS		$7,510,585.16	$1,156,227.71	$8,666,812.87

SUMMARY

Expenditures to December 31, 1920	
The Rockefeller Foundation	$24,330.75
China Medical Board	7,528,504.66
	$7,552,835.41
Less credits listed above	42,250.25
Balance 1920 and prior years	$7,510,585.16
Expenditures during 1921	1,156,227.71
NET TOTAL DECEMBER 31, 1921	$8,666,812.87

EXHIBIT P

STATEMENT OF TRANSACTIONS RELATING TO INVESTED FUNDS

General Fund

Securities Sold, Redeemed, or Exchanged

	Name	Rate Per Cent	Total Proceeds	Gain
Frs. 20,340,500	Belgian Government Treasury Notes for Restoration of Currency	5	$1,499,861.76	$11,032.39
$36,000	New York Central Lines Equipment	4½	36,000.00	345.85
$1,000,000	Philadelphia Co. Convertible Debenture	5	1,000,000.00	30,000.00
$50,000	Wheeling & Lake Erie R.R. Equipment Trust Series "B"	5	50,000.00	125.00
500	Shares Central National Bank of Cleveland, exchanged for 500 shares Central National Bank Savings & Trust Co.		79,611.10	
	Chesebrough Manufacturing Co., proceeds of sale of rights on 200 shares credited to cost of stock		104.16	
29,718	Shares Standard Oil Co. (Indiana), of a par value of $100, exchanged for 118,872 shares, of a par value of $25.			
49,000	Shares Standard Oil Co. (New Jersey) Common, of a par value of $100, exchanged for 196,000 shares of a par value of $25.			
2,900	Shares Standard Oil Co. (New Jersey) Common (Par $25).		550,553.50	21,666.00
450	Shares Superior Savings & Trust Co. of Cleveland, exchanged for 450 shares Central National Bank Savings & Trust Co		89,350.00	
	Woman's Hotel Co., liquidating dividend of 5%, received on 300 shares of stock, and credited to cost of stock		1,500.00	
			$3,306,980.52	$63,169.24

Securities Purchased or Received Through Exchange

	Name	Rate	Price Per Cent	Cost
Frs. 20,340,500	Belgian Government Treasury Notes for Restoration of Currency	5	99.22071	$1,488,829.37
950	Shares Central National Bank Savings & Trust Co., of Cleveland, received in exchange for 500 shares Central National Bank and 450 shares Superior Savings & Trust Co. Taken into books at the combined cost of the two old issues		177.8538	168,961.10
	Chehalis & Pacific Land Co., assessment of 4¾% on 220 shares added to cost of stock			1,045.00
118,872	Shares Standard Oil Co. (Indiana), of a par value of $25, received in exchange for 29,718 shares, of a par value of $100.			
178,308	Shares Standard Oil Co. (Indiana), of a par value of $25, received in payment of 150% stock dividend.			
4,964	Shares Standard Oil Co. (Nebraska), received in payment of 200% stock dividend.			
196,000	Shares Standard Oil Co. (New Jersey) Common, of a par value of $25, received in exchange for 49,000 shares of a par value of $100.			
				$1,658,835.47

EXHIBIT Q

SCHEDULE OF SECURITIES IN GENERAL FUNDS ON DECEMBER 31, 1921, REPRESENTING BOTH PRINCIPAL AND INCOME TEMPORARILY INVESTED

BONDS

Name	Interest Rate Per Cent	Date of Maturity	Amount	Price Per Cent	Book Value
American Agricultural Chemical Co. First Mortgage Convertible	5	Oct. 1928	$310,000	101.	$313,100.00
American Telephone & Telegraph Co. Thirty-year Collateral Trust	5	Dec. 1946	100,000	97.75	97,750.00
Armour & Co. Real Estate First Mortgage	4½	June 1939	1,000,000	93.25	932,500.00
Ashland Power Co. First Mortgage	5	Mar. 1928	8,000	100.	8,000.00
Atlantic & Birmingham Ry. First Mortgage	5	Jan. 1934	677,000	90.	609,300.00
Baltimore & Ohio R. R. Refunding and General Mortgage	5	Dec. 1995	650,000	99.75	648,375.00
Chicago & Alton R. R. Refunding Mortgage	3	Oct. 1949	551,000	65.	358,150.00
Chicago & Alton Ry., First Lien	3½	July 1950	854,000	53.	452,620.00
Chicago City & Connecting Railways Collateral Trust	5	Jan. 1927	1,305,000	85.	1,109,250.00
Chicago & Eastern Illinois R.R. Refunding and Improvement Mortgage	4	July 1955	300,000	63.	189,000.00
Chicago, Milwaukee & St. Paul Ry. General Mortgage Series "A"	4	May 1989	30,000	97.	29,100.00
Chicago, Milwaukee & St. Paul Ry. General Mortgage Series "C"	4½	May 1989	500,000	103.	515,000.00
Chicago, Milwaukee & St. Paul Ry. Debenture	4	July 1934	450,000	88.2838	397,277.50

Chicago, Milwaukee & St. Paul Ry. General and Refunding Mortgage Series "A"	4½	Jan. 2014	500,000	91.0625	455,312.50
Chicago & North Western Ry. Extension	4	Aug. 15 '26	50,000	95.	47,500.00
Chicago & North Western Ry. Sinking Fund Debenture	5	May 1933	80,000	102.	81,600.00
Chicago Railways Co. First Mortgage	5	Feb. 1927	500,000	97.	485,000.00
Cleveland, Cincinnati, Chicago & St. Louis Ry., St. Louis Division Collateral Trust	4	Nov. 1990	73,000	90.	65,700.00
Cleveland, Cincinnati, Chicago & St. Louis Ry. General	4	June 1993	700,000	83.893	587,250.00
Cleveland Short Line First Mortgage	4½	Apr. 1961	500,000	95.	475,000.00
Colorado Industrial Co. First Mortgage	5	Aug. 1934	2,000,000	80.	1,600,000.00
Dominion of Canada, Government of, Fifteen-year	5	Apr. 1931	500,000	94.565	472,825.00
Erie R.R. General Mortgage Convertible Fifty-year Series "B"	4	Apr. 1953	1,065,000	74.7175	795,742.30
Illinois Central R.R. Refunding Mortgage	4	Nov. 1955	300,000	87.	261,000.00
Interborough Rapid Transit Co. First Mortgage	5	Jan. 1966	1,750,000	96.8571	1,695,000.00
International Mercantile Marine Co. First and Collateral Trust Sinking Fund	6	Oct. 1941	2,848,290	97.5	2,777,082.75
Lake Erie & Western R.R. Second Mortgage	5	July 1941	100,000	100.	100,000.00
Lake Shore & Michigan Southern Ry. First Mortgage	3½	June 1997	926,000	87.	805,620.00
Lake Shore & Michigan Southern Ry. Debenture	4	May 1931	1,673,000	92.	1,539,160.00
Magnolia Petroleum Co. First Mortgage	6	Jan. 1937	1,809,000	100.	1,809,000.00
Missouri, Kansas & Texas Ry. General Mortgage Sinking Fund	4½	Jan. 1936	1,325,000	84.	1,113,000.00
Morris & Essex R.R. First and Refunding Mortgage	3½	Dec. 2000	175,000	82.75	144,812.50
Mutual Fuel Gas Co. First Mortgage	5	Nov. 1947	250,000	100.	250,000.00

EXHIBIT Q—*Continued*

Name	Interest Rate Per Cent	Date of Maturity	Amount	Price Per Cent	Book Value
National Railways of Mexico. Prior Lien Fifty-year Sinking Fund with January 1915 and subsequent coupons attached	4½	July 1957	$50,000	59.	$29,500.00
Secured 6% Notes for coupon due January 1, 1914		Jan. 1917	1,125	59.	663.75
Guaranty Trust Co. Receipt for July 1, 1914 coupon			1,125	59.	663.75
New Orleans, Texas & Mexico Ry. Non-Cumulative Income Series "A"	5	Oct. 1935	180,000	42.	75,600.00
New York Central Lines Equipment Trust of 1913	4½	Jan. '22–'28	252,000	99.039	249,579.06
New York Central & Hudson River R.R. Thirty-year Debenture	4	May 1934	330,000	88.45	291,885.00
New York, Chicago & St. Louis R.R. First Mortgage	4	Oct. 1937	35,000	95.	33,250.00
New York, Chicago & St. Louis R.R. Debenture	4	May 1931	1,303,000	87.	1,133,610.00
New York City Corporate Stock	4¼	Mar. 1964	100,000	94.5	94,500.00
New York Connecting R.R. First Mortgage	4½	Aug. 1953	500,000	95.69073	478,453.65
Northern Pacific Ry. Refunding and Improvement Mortgage	4½	July 2047	390,000	91.577	357,150.00
Pennsylvania R.R. Consolidated Mortgage Sterling	4	May 1948	£2,400	99.	11,880.00
Pennsylvania R.R. General Mortgage	4½	June 1965	$1,500,000	98.25	1,473,750.00
Pittsburg, Cincinnati, Chicago & St. Louis Ry. Consolidated Mortgage Series "I"	4½	Aug. 1963	500,000	103.	515,000.00

Reading Co.—Philadelphia & Reading Coal & Iron Co. General Mortgage	4	Jan. 1997	500,000	94.25	471,250.00
Rutland R.R. First Consolidated Mortgage	4½	July 1941	25,000	90.	22,500.00
St. Louis-San Francisco Ry. Prior Lien Series "A"	4	July 1950	1,500,000	72.75	1,091,250.00
St. Louis-San Francisco Ry. Adjustment Mortgage	6	July 1955	500,000	81.975	409,875.00
Seaboard Air Line Ry. Adjustment Mortgage	5	Oct. 1949	455,000	77.	350,350.00
Southern Pacific R.R. First and Refunding Mortgage	4	Jan. 1955	100,000	86.	86,000.00
United States Fourth Liberty	4¼	Oct. 15 '38	1,075,000	93.21347	1,002,044.80
United States Second Liberty Converted	4¼	Nov. 15 '42	2,100,000	93.00921	1,953,193.40
Wabash R.R. Second Mortgage	5	Feb. 1939	120,000	97.8	117,360.00
Washington Ry. & Electric Co. Consolidated Mortgage	4	Dec. 1951	450,000	83.5	375,750.00
Western Maryland R.R. First Mortgage	4	Oct. 1952	1,032,000	78.8913	814,158.76
Wheeling & Lake Erie R.R. Lake Erie Division First Mortgage	5	Oct. 1926	140,000	100.	140,000.00
Wheeling & Lake Erie R.R. Equipment Trust Series "B"	5	Apr.'22–'27	300,000	99.75	299,250.00
Wilson Realty Co. First Mortgage	6	July 1929	7,500	95.	7,125.00
TOTAL BONDS					$33,105,619.72

EXHIBIT Q—*Continued*

Name	Interest Rate Per Cent	Date of Maturity	Amount	Price Per Cent	Book Value
National Railways of Mexico. Prior Lien Fifty-year Sinking Fund with January 1915 and subsequent coupons attached	4½	July 1957	$50,000	59.	$29,500.00
Secured 6% Notes for coupon due January 1, 1914		Jan. 1917	1,125	59.	663.75
Guaranty Trust Co. Receipt for July 1, 1914 coupon			1,125	59.	663.75
New Orleans, Texas & Mexico Ry. Non-Cumulative Income Series "A"	5	Oct. 1935	180,000	42.	75,600.00
New York Central Lines Equipment Trust of 1913	4½	Jan. '22–'28	252,000	99.039	249,579.06
New York Central & Hudson River R.R. Thirty-year Debenture	4	May 1934	330,000	88.45	291,885.00
New York, Chicago & St. Louis R.R. First Mortgage	4	Oct. 1937	35,000	95.	33,250.00
New York, Chicago & St. Louis R.R. Debenture	4	May 1931	1,303,000	87.	1,133,610.00
New York City Corporate Stock	4¼	Mar. 1964	100,000	94.5	94,500.00
New York Connecting R.R. First Mortgage	4½	Aug. 1953	500,000	95.69073	478,453.65
Northern Pacific Ry. Refunding and Improvement Mortgage	4½	July 2047	390,000	91.577	357,150.00
Pennsylvania R.R. Consolidated Mortgage Sterling	4	May 1948	£2,400	99.	11,880.00
Pennsylvania R.R. General Mortgage	4½	June 1965	$1,500,000	98.25	1,473,750.00
Pittsburg, Cincinnati, Chicago & St. Louis Ry. Consolidated Mortgage Series "I"	4½	Aug. 1963	500,000	103.	515,000.00

Reading Co.—Philadelphia & Reading Coal & Iron Co. General Mortgage	4	Jan. 1997	500,000	94.25	471,250.00
Rutland R.R. First Consolidated Mortgage	4½	July 1941	25,000	90.	22,500.00
St. Louis-San Francisco Ry. Prior Lien Series "A"	4	July 1950	1,500,000	72.75	1,091,250.00
St. Louis-San Francisco Ry. Adjustment Mortgage	6	July 1955	500,000	81.975	409,875.00
Seaboard Air Line Ry. Adjustment Mortgage	5	Oct. 1949	455,000	77.	350,350.00
Southern Pacific R.R. First and Refunding Mortgage	4	Jan. 1955	100,000	86.	86,000.00
United States Fourth Liberty	4¼	Oct. 15 '38	1,075,000	93.21347	1,002,044.80
United States Second Liberty Converted	4¼	Nov. 15 '42	2,100,000	93.00921	1,953,193.40
Wabash R.R. Second Mortgage	5	Feb. 1939	120,000	97.8	117,360.00
Washington Ry. & Electric Co. Consolidated Mortgage	4	Dec. 1951	450,000	83.5	375,750.00
Western Maryland R.R. First Mortgage	4	Oct. 1952	1,032,000	78.8913	814,158.76
Wheeling & Lake Erie R.R. Lake Erie Division First Mortgage	5	Oct. 1926	140,000	100.	140,000.00
Wheeling & Lake Erie R.R. Equipment Trust Series "B"	5	Apr.'22–'27	300,000	99.75	299,250.00
Wilson Realty Co. First Mortgage	6	July 1929	7,500	95.	7,125.00
TOTAL BONDS					$33,105,619.72

EXHIBIT Q—*Continued*
STOCKS

Name	1921 Dividend Rate Per Cent	Number of Shares	Price Per Share	Book Value
American Ship Building Co. Preferred	7	9,303	$85.	$790,755.00
American Ship Building Co. Common	16	14,957	35.	523,495.00
Anglo-American Oil Co., Ltd. (Par £1)	30	366,517	30.50	11,178,768.50
Atchison, Topeka & Santa Fe Ry. Preferred	5	5,000	98.25	491,250.00
Atchison, Topeka & Santa Fe Ry. Common	6	21,100	95.2563	2,009,908.33
Borne-Scrymser Co. Capital	20	144	295.	42,480.00
The Buckeye Pipe Line Co. Capital (Par $50)	16	49,693	160.	7,950,880.00
Central National Bank, Savings & Trust Co. Capital	12	950	177.8538	168,961.10
Chehalis & Pacific Land Co. Capital		220	39.8745	8,772.40
Chesebrough Manufacturing Co., Consolidated, Capital	10	2,070	220.4522	456,336.14
Chicago City & Connecting Rys. Participation Certificates Preferred		17,530	69.1875	1,212,856.88
Chicago City & Connecting Rys. Participation Certificates Common		10,518	30.	315,540.00
Cleveland Arcade Co. Capital	16	2,500	98.6222	246,555.56
Cleveland Trust Co. Capital	12	381	234.904	89,498.77
Colorado & Southern Ry. First Preferred	4	7,000	54.	378,000.00
Consolidated Gas Co. of N. Y. Capital	7	20,000	127.50	2,550,000.00
The Continental Oil Co. Capital	8	20,550	62.2473	1,279,182.61

The Crescent Pipe Line Co. (Par $50)	6	14,120	60.	847,200.00
Cumberland Pipe Line Co. Capital	12	3,000	81.333	244,000.00
Erie R. R. First Preferred		21,400	45.8306	980,773.76
Eureka Pipe Line Co. Capital	10	12,357	361.3331	4,464,995.59
Galena Signal Oil Co. Preferred	8	4,193	139.70	585,779.50
Galena Signal Oil Co. Common		20,000	189.7031	3,794,059.59
Great Lakes Towing Co. Preferred	7	1,527	88.7361	135,500.05
Great Lakes Towing Co. Common	5	1,200	12.	14,400.00
Indiana Pipe Line Co. (Par $50)	16	24,845	125.111	3,108,385.28
Kanawha & Hocking Coal & Coke Co. Preferred	7	202½	100.	20,250.00
Kanawha & Hocking Coal & Coke Co. Common		668¼	90.953	60,779.97
Manhattan Ry. Capital	7	10,000	128.775	1,287,750.00
Missouri Pacific R.R. Voting Trust Certificates for Convertible Preferred		21,980	55.50	1,219,890.00
National Lead Co. Preferred	7	1,100	104.	114,400.00
National Lead Co. Common	6	10,000	50.	500,000.00
National Transit Co. (Par $12.50)	28	126,481	28.50	3,604,708.50
New York, Chicago & St. Louis R.R. Second Preferred	5	400	78.70	31,480.00
New York, Chicago & St. Louis R.R. Common	5	100	55.	5,500.00
New York Transit Co. Capital	16	12,392	300.	3,717,600.00
Northern Pacific Ry. Capital	7	700	91.7625	64,233.75
Northern Pipe Line Co. Capital	10	9,000	110.	990,000.00
Pere Marquette Ry. Preferred		5,740.8	54.56	313,248.00
Provident Loan Certificates (Par $5,000)	6	40	100.	200,000.00
Seaboard Air Line Ry. Preferred		4,300	54.	232,200.00
Seaboard Air Line Ry. Common		3,400	21.	71,400.00
Sheffield Farms Co. Incorporated Preferred	6	150	99.40	14,910.00
The Solar Refining Co. Capital	10	4,538	185.007	839,561.76
Southern Pipe Line Co. Capital	10	24,845	229.5556	5,703,308.88
South West Pennsylvania Pipe Lines Capital	6	8,000	160.	1,280,000.00

EXHIBIT Q—*Continued*

Name	1921 Dividend Rate Per Cent	Number of Shares	Price Per Share	Book Value
Standard Oil Co. (Indiana) Capital (Par $25)	16	297,180	$86.70	$25,765,506.00
The Standard Oil Co. (Kansas) Capital	24	4,914	275.016	1,351,433.05
Standard Oil Co. (Kentucky) Capital	12	14,726	70.2547	1,034,570.71
Standard Oil Co. (Nebraska) Capital	10	7,446	90.	670,140.00
Standard Oil Co. (New Jersey) Non-voting Cumulative Preferred	7	55,000	102.8729	5,658,008.48
Standard Oil Co. (New Jersey) (Par $25) Common	20	193,100	182.375	35,216,612.50
The Standard Oil Co. (Ohio) Common	16	16,956	204.	3,459,024.00
The Standard Oil Co. (Ohio) Non-voting Cumulative Preferred	7	17,088	106.	1,811,328.00
Tilden Iron Mining Co. Capital		1,780	27.35	48,683.46
Union Tank Car Co. Capital	7	24,000	66.9203	1,606,087.97
Virginia-Carolina Chemical Co. Common		35,000	67.	2,345,000.00
Washington Oil Co. Capital (Par $10)	20	1,774	30.	53,220.00
Western Maryland Ry. Second Preferred		500	46.	23,000.00
Western Pacific R.R. Corporation Preferred	6	20,195	43.50	878,482.50
Western Pacific R.R. Corporation Common		30,292½	15.25	461,960.62
Wilson Realty Co. Capital		591	100.	59,100.00
Woman's Hotel Co. (In liquidation) Capital		300	25.	7,500.00
Total Stocks				$144,589,212.21

SUMMARY

Bonds	$33,105,619.72
Stocks	144,589,212.21
Total book value of investments belonging to General Funds, principal and income	$177,694,831.93

The foregoing investments are apportioned as follows:

General Fund	$171,204,624.50
General Fund Income	3,299,674.43
Reserve	3,190,533.00
TOTAL	$177,694,831.93

EXHIBIT R

SCHEDULE OF SECURITIES IN SPECIAL FUNDS ON DECEMBER 31, 1921

John D. Rockefeller Fund

BONDS

Name	Interest Rate Per Cent	Date of Maturity	Amount	Price Per Cent	Book Value
Canada Southern Ry. Consolidated Mortgage Series "A"	5	Oct. 1962	$37,000	100.	$37,000.00
Total Bonds					$37,000.00

Laura S. Rockefeller Fund

BONDS

Name	Interest Rate Per Cent	Date of Maturity	Amount	Price Per Cent	Book Value
Colorado Industrial Co. First Mortgage	5	Aug. 1934	$50,000	80.	$40,000.00
Virginia-Carolina Chemical Co. First Mortgage	5	Dec. 1923	10,000	93.	9,300.00
Total Bonds					$49,300.00

Henry Sturgis Grew Memorial Fund
BONDS

United States Second Liberty Loan Converted	4¼	Nov. 15 '42	$25,850	96.71167	$25,000.00
Total Bonds					$25,000.00

Arthur Theodore Lyman Endowment
BONDS

United States Fourth Liberty Loan	4¼	Oct. 15 '38	$5,850	94.01709	$5,500.00
Total Bonds					$5,500.00

February 18, 1922

Mr. John D. Rockefeller, Jr.,
Chairman of the Board of Trustees,
The Rockefeller Foundation,
New York, N. Y.

Dear Sir:

We have examined the accounts of

THE ROCKEFELLER FOUNDATION

for the year ended December 31, 1921, and report thereon as follows:

The assets recorded on the books of account kept at the administration offices of the Foundation, were verified by actual inspection and count, or by correspondence with depositories and agents or by examination of the latest available financial reports or other data pertinent thereto. The increases or decreases during the year in the Foundation's general and special fund accounts, both principal and income, and the respective balances as of December 31, 1921, were verified by us.

We ascertained that all income receivable during the year from investments, bank deposits, etc., had been properly accounted for and that all disbursements were supported by vouchers, properly approved.

The minutes of the respective Executive Committees and of the Finance Committee were examined and we noted that all pledges and appropriations had been recorded on the books of account and that purchases, sales and conversions of assets effected during the year had been duly authorized.

We hereby certify that, in our opinion, the accompanying balance sheet, the statements of income and disbursements and of appropriations and disbursements show correctly the

financial position of the Foundation at December 31, 1921, and the result of its financial activities for the year ended with that date.

Very truly yours,

LYBRAND, ROSS BROS. & MONTGOMERY,
Accountants and Auditors.

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The Rockefeller Foundation
61 Broadway, New York

Rockefeller Foundation
Yr.
1-10-1924

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INTERNATIONAL HEALTH BOARD

CHINA MEDICAL BOARD

DIVISION OF MEDICAL EDUCATION

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THE ROCKEFELLER FOUNDATION

OFFICERS, MEMBERS, AND COMMITTEES

1922

Members

John G. Agar
Wallace Buttrick
John W. Davis
Simon Flexner
Raymond B. Fosdick
Frederick T. Gates
A. Barton Hepburn[1]
Harry Pratt Judson
Vernon Kellogg
John D. Rockefeller
John D. Rockefeller, Jr.
Wickliffe Rose
Julius Rosenwald
Martin A. Ryerson
Frederick Strauss
George E. Vincent

Executive Committee

George E. Vincent, *Chairman*

Wallace Buttrick
Raymond B. Fosdick
Vernon Kellogg
Wickliffe Rose

Edwin R. Embree, *Secretary*

Finance Committee

John D. Rockefeller, Jr., *Chairman*

Raymond B. Fosdick
Frederick Strauss

Chairman of the Board of Trustees

John D. Rockefeller, Jr.

President

George E. Vincent

General Director of the International Health Board

Wickliffe Rose

Director of the China Medical Board

Roger S. Greene

General Director of the Division of Medical Education

Richard M. Pearce

Secretary

Edwin R. Embree

Treasurer

Louis Guerineau Myers

Comptroller

Robert H. Kirk

[1] Died January 25, 1922.

THE ROCKEFELLER FOUNDATION

OFFICERS, MEMBERS, AND COMMITTEES

1923

Members

John G. Agar
Wallace Buttrick
John W. Davis
Simon Flexner
Raymond B. Fosdick
Frederick T. Gates[1]
Harry Pratt Judson
Vernon Kellogg
John D. Rockefeller
John D. Rockefeller, Jr.
Wickliffe Rose
Julius Rosenwald
Martin A. Ryerson
Frederick Strauss
George E. Vincent
William Allen White
Ray Lyman Wilbur

Executive Committee

George E. Vincent, *Chairman*
Wallace Buttrick
Raymond B. Fosdick
Vernon Kellogg
Wickliffe Rose
Edwin R. Embree, *Secretary*

Finance Committee

John D. Rockefeller, Jr., *Chairman*
Raymond B. Fosdick
Frederick Strauss

Chairman of the Board of Trustees

John D. Rockefeller, Jr.

President

George E. Vincent

General Director of the International Health Board

Frederick F. Russell

Director of the China Medical Board

Roger S. Greene

General Director of the Division of Medical Education

Richard M. Pearce

Secretary

Edwin R. Embree

Treasurer

Louis Guerineau Myers

Comptroller

Robert H. Kirk

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[1] Resigned July 2, 1923.

THE ROCKEFELLER FOUNDATION

President's Review

To the Members of the Rockefeller Foundation:

Gentlemen:

I have the honor to transmit herewith a general review of the work of the Rockefeller Foundation for the period January 1, 1922, to December 31, 1922, together with the detailed reports of the Secretary and the Treasurer of the Foundation, the General Director of the International Health Board, the Director of the China Medical Board, and the General Director of the Division of Medical Education.

Respectfully yours,

GEORGE E. VINCENT,

President.

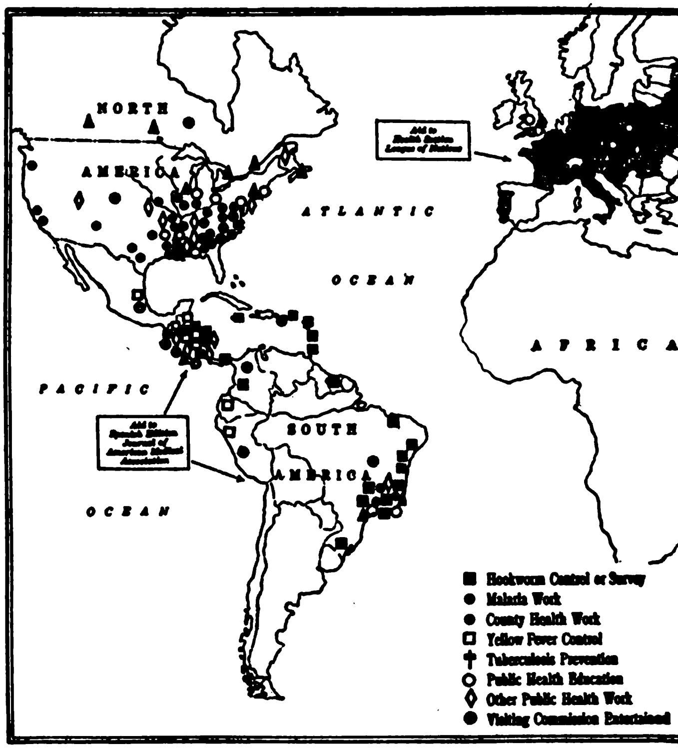
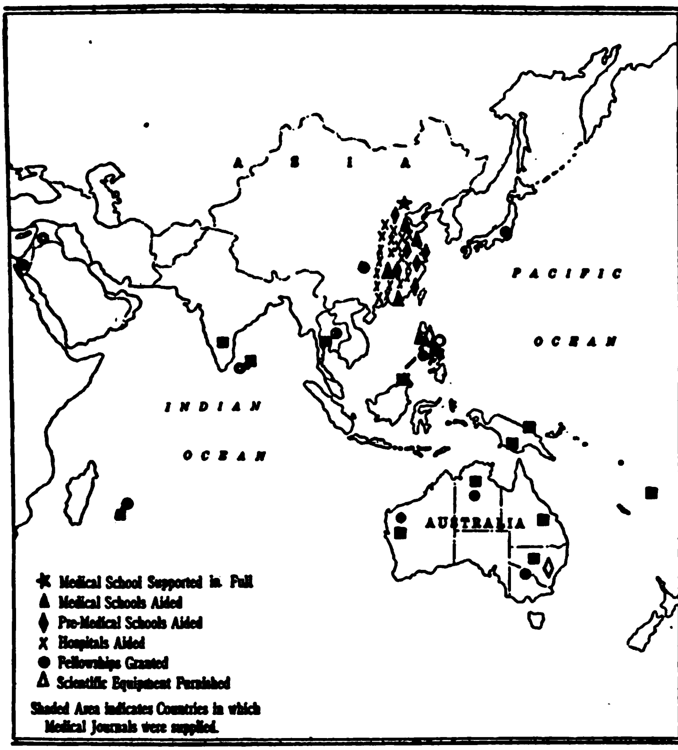


Fig. 1.—Map of World-wide Activities

The Rockefeller Foundation is concentrating its resources upon a comparatively limited range of activities within the closely related fields of public health and medical education. The public health program graphically presented on this map is carried on through the International Health Board. Work in the field of medical education is in charge of the Division of Medical Education, except the work in China which is done through the China Medical Board.

Campaigns for the *relief and control of hookworm disease* were carried on in twenty-one governmental areas throughout the world. Sixty-six demonstrations in *malaria control* were supported in ten southern states, and field studies in malaria control conducted in six other countries. Aid was extended to full-time *county health departments* in 163 counties in the United States, and similar work aided in Brazil. Activities for the *eradication of yellow fever* were carried on at the invitation of the government in Mexico and in other countries. French health agencies were assisted in *antituberculosis work*. Contributions were made to the development of schools of hygiene and other agencies for *training health personnel* in Brazil, Czechoslovakia, England, the Philippine Islands, Poland, and the United States. The sum of $32,840 a year for five years was given to the *Health Section* of the *League of Nations* to maintain an



of the Rockefeller Foundation in 1922

international epidemiological intelligence service, and $60,080 a year for three years for international exchange of health personnel. *Other public health activities* include: financial co-operation in a demonstration of rural health administration in the province of New Brunswick, Canada; temporary financial aid, with advice and counsel, in establishing a public health laboratory service in several American states and Central American countries, and a department of health in Czechoslovakia; the lending of experts as consultants.

For the promotion of *medical education*, the Foundation assisted medical schools in various countries, furnished *scientific equipment* and English or American *medical literature* to eighty-two European institutions, and made a study of medical schools and the needs of medical science in Europe.

In China, *one medical school was supported in full*, and aid was given to *three other medical schools*, a number of *hospitals*, and the *premedical science teaching* in six institutions.

Fellowships were provided for 237 individuals from 23 countries. A leading *health authority* and a *commission* of medical scientists from France were *entertained*.

PRESIDENT'S REVIEW

The Year in Brief

During the year 1922 the Rockefeller Foundation, either directly or through its departmental agencies, the International Health Board, the China Medical Board, and the Division of Medical Education, (1) endowed chairs of medicine and of surgery in Hongkong University; (2) pledged $1,125,000 toward new buildings for the College of Medicine of the State University of Iowa; (3) contributed to the current maintenance of two medical schools in Canada; (4) completed the buildings, strengthened the faculty, and wholly financed the Peking Union Medical College; (5) agreed to appropriate $300,000 toward laboratories and premedical teaching in two Chinese institutions and in one missionary university in Peking; (6) helped nineteen hospitals in China to increase their efficiency in the care of patients and in the further training of doctors and nurses; (7) promised to co-operate in the rebuilding and reorganization of the medical school of São Paulo, Brazil, and of the medical school of Siam in Bangkok; (8) made a survey of medical schools in Austria, Czechoslovakia, Germany, Hungary, Poland, and Switzerland, and studies of English and Scotch methods of

clinical teaching; (9) sent eminent medical men as visiting professors or consulting officers to China, the Philippines, Brazil, and Salvador; (10) arranged for a commission of medical scientists from Strasbourg to visit the United States and England; (11) gave emergency aid in the form of medical literature, laboratory supplies and apparatus, fellowships and stipends to promising investigators and teachers in the Pasteur Institute of Paris and in many other European centers; (12) pledged two million dollars toward the site, building, and equipment of a school of hygiene in London; (13) co-operated with state boards of health in maintaining institutes and instruction for health workers; (14) shared in thirty-four county-wide and thirty-two town demonstrations of malaria control in ten southern states and continued field studies and surveys in the United States, Porto Rico, Nicaragua, Brazil, Palestine, Australia, and the Philippines; (15) co-operated with the Mexican and other governments in steadily restricting the prevalence of yellow fever; (16) resurveyed centers of hookworm infection in four southern states, and carried on control work in twenty-one foreign governmental areas; (17) took part in promoting full-time health service in 163 counties in eighteen states of the United States, and in several counties in Brazil; (18) agreed to

support for five years the disease-reporting service and for three years the international exchange of health personnel program of the Health Section of the League of Nations; (19) provided fellowships in public health, medicine, nursing, chemistry, and physics to 237 advanced students from twenty-three countries; (20) by consultation and providing of personnel aided public health administration in the United States, Australia, Brazil, Canada, Central America, Czechoslovakia, France, the Philippines; (21) contributed to mental hygiene projects, demonstrations in dispensary administration, hospital information service, surveys of nursing education and hospital management, the organization of tuberculosis work in France, the training of French health visitors, and other undertakings in the fields of public health and medical education.

The First Decennium

The Rockefeller Foundation was incorporated May 14, 1913, under a special charter granted by the State of New York and with an initial endowment of $100,000,000, the gift of Mr. John D. Rockefeller. Administration was entrusted to an original board of nine members, who were given the power to add to their number and to choose their successors. A few weeks later the Rockefeller Sanitary Commission, which had

since 1910 been combating hookworm disease in the Southern States, was reorganized as the International Health Board and became a departmental agency of the Rockefeller Foundation. In 1914 a similar subsidiary, the China Medical Board, was created to administer a program of medical education in the new Oriental republic. The rapidly developing work of the Foundation in aiding medical schools in many countries led the trustees in 1919 to set up a Division of Medical Education. Through these agencies the Foundation has co-operated during its first decade, chiefly in public health projects and the improvement of medical education, with governments and institutions in sixty countries.

During the first year or two, while the trustees were considering questions of policy, gifts were made to a variety of institutions and projects, for example, the Palisades Interstate Park, a Wild Life Refuge in Louisiana, the American Academy in Rome, an investigaton of industrial relations, and to various other objects which no longer fall within the scope of the Foundation's work. By the terms of gift, the founder retained the right during his lifetime to direct the distribution, in fulfilment of the purpose of the charter, of $2,000,000 of the income annually. This resulted in numerous appropriations to a wide range of charitable and religious societies up to

July 19, 1917, when Mr. Rockefeller waived his right of designation and left the unrestricted control of the entire principal and income in the hands of the trustees.

With the outbreak of the World War, the Foundation was one of the first American agencies to send a relief commission to Belgium and other Continental countries, but as soon as the Commission for Relief in Belgium and the American Red Cross assumed responsibility the trustees withdrew their own agents and made contributions for relief through these societies. The war program of the Rockefeller Foundation included medical and surgical research and instruction through the Rockefeller Institute, the Medical Division of the National Research Council, and other centers; welfare work for soldiers and prisoners through the agencies equipped for this purpose; food and clothing supplied in part directly but chiefly through the Commission for Relief in Belgium, the American Relief Administration, and the American Red Cross; and a war emergency campaign against tuberculosis in France. The total sum spent by the Foundation on war work was nearly twenty-two and one half million dollars.

From the outset the example of the Rockefeller Institute for Medical Research, the success of the International Health Board in applying

scientific knowledge, and the interest of the Foundation in aiding Western medicine in China suggested policies which have been consistently developed. Public health work in co-operation with governments called for a supply of specially trained men and women. The dependence of sound preparation for preventive medicine upon an efficient general medical education became increasingly clear. Thus the Foundation has come to concentrate its attention and resources upon the closely related fields of public health and medical education. Even in these large spheres it has concentrated upon activities which are described and illustrated in this Review.

During the past ten years the Rockefeller Foundation has received from Mr. John D. Rockefeller a total of $182,704,624. Its total disbursements have amounted to $76,800,000, representing the income from year to year and $17,500,000 appropriated from principal. In addition it has pledged future income to the extent of $15,600,000.

Medicine an International Product

Modern medicine has been likened to a river whose many tributaries have, during the centuries, flowed from all quarters of the world. From Egypt, Babylonia, India, China came rivulets of mingled superstition, empirical art,

and positive knowledge. Greece was a copious spring from which a growing volume of insight, skill, and wisdom welled even from Homeric times down into the early centuries of the Christian Era. Rome was a sandy plain absorbing rather than augmenting the stream of medical lore which found three channels, through southern Italy, Byzantium, and the Arab civilization, into the deepening current of the Renaissance. Thence, flowing on into modern times, the medical tradition has become a broad river swollen by tributaries from Italy, France, Holland, Britain, Germany, Scandinavia, Russia, the United States, the British dominions, Japan, and other countries.

A mere enumeration of the names famous in the history of medicine affords striking evidence of its international character. Hippocrates, Aristotle, and Galen, the Greeks; Rhazes and Abbas, the Persians; Avenzoar, the Arab; Mondino and Morgagni, the Italians; Vesalius, the Belgian; Paré, the Frenchman; Harvey, Hunter, and Jenner, the Englishmen; Boerhaave, the Hollander; Johannes Müller, the German; and the moderns, Pasteur, Koch, Lister, Virchow, Ehrlich, Manson, Metchnikoff, and Reed. Since 1901 the Nobel prize for contributions to medical science has been awarded to eighteen men of twelve different nationalities: four to Germans,

two to Frenchmen, two to Russians, two to Danes, and one each to an American, an Austrian, a Belgian, an Englishman, an Italian, a Spaniard, a Swede, and a Swiss.

Obviously, international co-operation in creating medical science depends upon communication of ideas from worker to worker and from country to country. Hippocrates, Celsus, and Galen produced a body of medical literature. Arab authors transmitted it to Western Europe. Today every leading country is producing a copious literature in the many departments of modern scientific medicine. To the prompt interchange of information which this printed matter makes possible is in part due the rapid contemporary progress in medical research and practical procedures. The interruption of this traffic in ideas during the World War was a serious thing. The Rockefeller Foundation is helping to restore such commerce to something like its normal state by the distribution of medical periodicals in Europe.

Quite as important as the circulation of the printed page are personal intercourse between leaders of science, and the migration of advanced students. The early pioneers in medicine set an example of itinerant pursuit of knowledge and experience. Hippocrates, born in Cos, studied at Athens and traveled frequently in

Thrace, Thessaly, and Macedonia. Galen, a native of Pergamus, received his medical education at Alexandria and finally made Rome his headquarters. Vesalius left his birthplace in Brussels to study or teach at Louvain, Paris, Venice, and Padua, and to travel in Spain and Palestine. Medical students from many nations used to resort to the famous schools of Italy, France, and Holland. In the nineteenth century the rapid progress of German medicine drew physicians and advanced students from abroad to many German and Austrian universities and clinics. Berlin, Vienna, Paris, and London each attracted representatives from parts of the world where medicine was less advanced—Southern Europe, Central and South America, the United States, Japan, and the British dominions.

The formation of international scientific associations has helped to create a sense of solidarity among medical scientists. Since 1867, seventeen international medical congresses have been held in the chief capitals of Europe and one in Washington. The Rockefeller Foundation, by granting fellowships for study outside the holders' own countries, by inviting commissions from foreign nations to visit the United States and other countries, by enabling the Health Organization of the League of Nations to finance the

intermigration of health officers, and by other methods, is helping medical scientists and practitioners of all nations to work together more effectively.

From Magic to Microbe

Auguste Comte in his *Positive Philosophy* asserted that every body of knowledge passes through two stages, the theological and the metaphysical, into a third, the positive or scientific. In the first stage happenings are attributed to the action of spirits and divinities; in the second, to abstract entities; while in the third, causal connections are ignored and the scientific mind is content merely to record the fact that certain things always occur simultaneously or in sequence. There is enough truth in Comte's so-called law to make it suggestive and useful, although his statement is too precise and mechanical.

The growth of medical science has followed in a general way Comte's law. The practice of medicine has often been a function of sorcerers, magicians, priests, and astrologers. The very term "medicine man" is significant. Among primitive people today, the healing art is saturated with superstition, fear of evil spirits, faith in the efficacy of amulets, charms, weird potions, and grotesque cures. But the ignorance, super-

stition, and credulity about disease and its cure displayed by the great populations of Europe and America should make for humility. The advertisements in many newspapers, the flourishing of palpable quacks, the prevalence of preposterous cults, the crazes which sweep through whole nations, are striking evidence that our civilization is only on the border line of the scientific stage. Higher education itself seems far from guaranteeing immunity against the attacks of a primitive credulity.

Greek medicine appears from the outset to have been relatively free from superstition. After the Renaissance, medicine began a steady advance. Anatomy flourished with Vesalius; with Harvey physiology was revived; Morgagni and Bichat created pathology; von Baer reorganized embryology; the theory of organic evolution gave an impetus to medical research; with Pasteur and Koch bacteriology came into its own; biochemistry has assumed a fundamental rôle. In spite of many survivals of mysticism and metaphysics which will long persist, modern medicine has entered the scientific stage.

Methods, Spirit, and Scope of Modern Medicine

Medical science, in common with other sciences, relies upon observation, comparison, and experiment, or upon a combination of these

methods. The anatomist by observation and comparison, that is, by dissection of human and animal bodies and by examination of the living, maps and describes the intricate structure of organic forms and studies the laws of growth and development. The physiologist by physical means, by chemical analysis, by observation of men, and by experiment upon animals gains insight into the nature of vital processes. The bacteriologist by observing through the microscope the minute plants and organisms which live in blood and tissues, by introducing them into animals under varying conditions, and by comparing results discovers definite and verifiable facts about the causes of health and disease. The pathologist studies by microscopic methods, by examination of morbid growths, by experimentation upon animals, the nature and effects of organic diseases. The results which each man secures and the methods he employs are made public and are then tested by other investigators. Mere personal opinion and unverified assertion have no place in modern scientific medicine.

Upon the physician falls the task of discovering the cause or causes of disease in individual patients and of helping them to regain a state of normality or health. This is often a much more complicated and difficult thing than the duty laid upon the laboratory scientists. The bedside

practitioner must apply knowledge supplied by anatomy, physiology, pharmacology, biochemistry, pathology, bacteriology, to which he must add his own personal experience, data derived from records of many cases, and the summarized observations and conclusions of other clinicians. Medicine in this sense is obviously an art based upon science rather than an exact science in itself. When the doctor has at his disposal in a given case all the data that modern methods can furnish, temperatures, blood pressures, blood counts, chemical and bacteriological tests, X-ray plates, reports of similar cases, his

LOUIS PASTEUR
1822–1895

Fig. 2.—Crystallographer, mycologist, biochemist, pathologist, immunologist, founder of modern bacteriology, although never receiving a medical degree, Louis Pasteur, whose centenary is now being celebrated, has had perhaps more influence on medical science and public health than any other man in modern times. It can be said without exaggeration that millions of human lives have been saved by his discoveries. The Pasteur Institute of Paris, which he founded, is receiving aid from the Rockefeller Foundation during the period in which it is recovering from the effects of the War

own recorded or remembered experience, the testimony of his own trained senses, he must interpret all these facts by a careful process of logical reasoning and organize them into either a final judgment, or into a tentative hypothesis, which is subject to further tests by later developments. This calls for careful preparation, the scientific attitude, sincerity, and constant hospitality to new knowledge and improved methods.

The spirit of modern medicine is, then, scientific; it seeks to be open-minded toward new truth, provided this can be rationally related to the great body of firmly established and organized knowledge about nature, life, and mind, about which all scientific men agree. Scientific medicine cannot accept ideas which are merely mystical, or imply unknown and unverifiable physical or chemical properties, or invoke supernatural intervention, or are in other ways clearly fantastic or beyond the reach of any available demonstration or experiment. So also modern medicine refuses to be labeled with the name of any school or cult. It is committed to no "pathy"; it knows no panacea; it is prejudiced only in favor of conclusions drawn by soundly reasoned processes from exact and verified facts. It recognizes the intricacy of its problems; it realizes that only a beginning has been made; it does not hesitate to admit ignorance or to suspend judgment. Its constant aim is the dis-

covery of truth and its application to human need. These ideas, it must be admitted, are the conscious principles of a relatively small number of the medical men of the world. But the modern scientific spirit is permeating the great body of practitioners who have in the past too much relied upon dogmatic diagnosis, rule-of-thumb, "shot-gun" prescriptions, and a cheerful bedside manner. The personality and attitude of the physician toward his patients ought to be important sources of power and success but they should supplement rather than take the place of the scientific method and spirit.

The scope of modern medicine is as wide as the range of influences, physical, biological, mental, and social, which affect health. It has been asserted with some reason that in its preoccupation with the diseases of the body, scientific medicine has too much neglected the psychic and social factors. The rapid spread of cults which invoke various forms of mental suggestion, is probably due in some measure to the failure of modern medicine to include in its scope the relations of physical and mental states, to study these in a scientific spirit, and to utilize the healing powers of rationally controlled suggestion. Recent progress in psychiatry, the war-time experience with disorders of the mind, the rise of mental hygiene, and the increased attention being given to these subjects in medical

schools and at professional meetings are evidences that the mental aspect of disease is being recognized more fully. So too with the social factor. Health nurses or special visitors of a few leading hospitals now visit the homes of dispensary callers and hospital patients and make reports to the medical staff about housing, family relations, and economic status—factors which often have a vital bearing upon the condition of the patient. Thus modern medicine is coming to appreciate that its problem is not merely the body of the sick man, but the larger whole which includes his mental states and his physical and social environment. Perhaps the most important and significant extension of the scope of modern medicine is into the field of prevention by providing immunity through vaccination against many communicable maladies, by co-operating largely with public health authorities, by insisting on frequent examinations to detect incipient defects and diseases, and most of all by urging conformity to the laws of personal hygiene and the seeking of positive, vigorous, abounding health.

Public Opinion and Medical Progress

In democratic countries like the United States, Great Britain, Canada, and Switzerland, the popular estimate of the social value of science,

the general esteem in which scientific men are held, the willingness of legislative bodies and of private citizens to supply funds, and the readiness of leaders and people to accept and apply the results of scientific research are determining factors in the progress of knowledge. Unless the leaders of opinion and a substantial proportion of the adult population appreciate the aims and methods of science, understand something of the value of evidence, are familiar with reasoning processes, and are prepared to recognize the authority of disinterested experts, science cannot attain the place it deserves or render the service of which it is capable. Chemical, electrical, and mechanical engineers have won distinction and recognition because their work is tangible and convincing both to the trained leader and to the man in the street. The medical scientist, with vastly more complex problems to solve, must ask for the support of a much more intelligent, imaginative, and sympathetic form of public opinion. For example, as preventive medicine gradually restricts or eliminates certain common diseases, the maladies which remain may be those relatively much more difficult to deal with. Unless the public appreciates this fact, doctors in the future may be plausibly but quite unjustly charged with being less efficient than their predecessors.

On the whole, the response of popular governments, of democratic publics, and of individuals to the demands of modern medicine has been encouraging. Medical schools, teaching hospitals, and research institutes have been improved, multiplied, and supported by private gifts and public grants. Public health activities have been widely extended; their efficiency has steadily increased; appropriations for them have rapidly mounted. Yet in spite of these evidences of at least popular acquiescence there are disheartening instances of an almost benighted ignorance. If there is any one thing that has been repeatedly demonstrated to the complete satisfaction of all well-trained minds capable of dealing logically with evidence it is that vaccination for smallpox affords an extraordinary immunity against that disease. In autocratic Germany before the war, thanks to a strict enforcement of vaccination, smallpox was almost unknown. In the United States, on the other hand, the disease is widely diffused; in some regions it is almost endemic. From time to time it breaks out in towns and cities. It is not uncommon for individuals and groups to resist vaccination. Occasionally the law is defied and remains unenforced. Anti-vaccination societies carry on fanatical campaigns of misrepresentation, offering misleading statistics, invoking the

authority of discredited physicians, citing unverified cases, and making emotional appeals. The very sincerity of such agitators is at once an evidence of mental instability in the population and an added danger to sound thinking and wise social policy.

The question of animal experimentation, a vital necessity to medical research, has a direct bearing upon the relation of public opinion to scientific progress. If the anti-vivisectionists could have their way they would forbid by law procedures which have saved and will in the future save untold numbers of human lives by making possible modern surgery and our present knowledge of such diseases as diabetes, smallpox, tuberculosis, diphtheria, cerebrospinal meningitis, tetanus, puerperal fever, syphilis, rabies, bubonic plague, relapsing fever, cholera, and yellow fever. The only protection which medical science and social welfare have lies in the public opinion to which legislatures must in the long run defer. If the leaders of opinion, educational institutions, the press, the platform, women's clubs, popular forums, party organizations, and thinking citizens generally will take a positive, aggressive interest, secure the facts, select and trust experts, reason clearly, and have the courage of conviction, modern scientific medicine will be appreciated and the common welfare pro-

moted. There can be no serious doubt as to the outcome, because in spite of a noisy minority the great body of public opinion is sound.

The Training of Doctors

The growth of scientific medicine during the last fifty years has radically changed the prerequisites, subject matter, organization, methods, equipment, duration, and cost of medical education. Knowledge and technique have enormously increased. Demands upon the time and energy of teachers have grown heavy and exacting. The expenses for laboratories, teaching hospitals, salaries, and supplies have mounted rapidly. Under the new conditions the earlier apprenticeship system has disappeared, although close association between the student and his teachers is valued and is retained in the best contemporary schools. The proprietary medical college manned and managed by a group of practicing physicians has been unable to maintain itself in competition with privately endowed or publicly supported schools. Private practitioners, however, still constitute the great body of clinical teachers in most medical schools the world over.

The new conditions have produced the typical modern center for teaching and investigation, the unified university medical school in a stimulating

scientific and cultural environment, controlling its laboratories and hospitals under the direction of full-time staffs. Only a few university schools throughout the world have reached or approximated this standard. The tendency, however, in all advanced countries is toward this university type. Traditional preconceptions, the vested interests of practitioner professors, unfamiliarity with new ideas and methods, and lack of funds are the more obvious obstacles to progress. A leading aim of the Rockefeller Foundation is to further the development of medical schools of the university type by diffusing information, training personnel, and, in important centers, by making appropriations toward endowment or buildings or both.

The idea of teaching the medical student all that is known about health and disease is on the face of it absurd. There is complaint already that too much is being forced upon him, and that he has no time to think for himself. It is agreed that the undergraduate medical course should not seek to give a complete education but to ground the student in the fundamentals of knowledge and technique and inspire in him the scientific spirit and a sense of social obligation. These necessary limitations are resulting in the development of graduate teaching. The time seems to be coming when all the surgical and

other specialties and advanced laboratory work will be taught as graduate subjects.

The raising of standards, with consequent lengthening of the medical course and the increase of its cost to both individual students and to society, gives rise to a number of serious questions. The shortening by two years of the combined elementary and secondary school period is advocated by some in order to reduce the age at which a doctor may begin his career. The granting of more scholarships to promising students is urged. There is agitation for a shorter, less expensive type of training to maintain the supply of general practitioners, on the theory that many superficially trained doctors will settle in rural districts which now lack resident physicians. Other people foresee a system of local hospitals serving surrounding areas by outpost dispensaries and visiting nurses. While some differentiation may be expected between doctors who go into general practice immediately and those who pursue graduate studies in the specialties, there is no reason to suppose that in advanced countries the standards of medical education will be lowered. The tendency at present is in quite the opposite direction.

From Brussels to Bangkok

The Foundation's constructive program in medical education during 1922 included an agree-

ment to contribute $1,125,000 toward the building project of the State University of Iowa; contributions to the maintenance funds of the medical schools of the Université de Montréal and the University of Alberta, Canada; completion and maintenance of Peking Union Medical College; annual gifts to the medical schools of Shantung Christian University, Yale-in-China, and St. John's University, Shanghai; the endowment of chairs of medicine and of surgery in Hongkong University Medical School; an agreement to assist the Siamese government to reorganize its medical school in Bangkok; a similar proposal to the medical school of São Paulo, Brazil; the lending of expert administrators or teachers to the São Paulo school as well as to Peking Union Medical College, the University of the Philippines, and the medical school of Salvador. Besides all this, surveys of medical schools were made in Austria, Czechoslovakia, Germany, Hungary, Poland, and Switzerland.

In addition to the twelve schools mentioned in the first paragraph of this section, the Foundation has during recent years made substantial contributions to eight others. The Free University of Brussels is receiving three and a half million dollars for the construction of a modern medical center. Five millions have been given to University College and to University College

Hospital Medical School, London, to enable them to improve their equipment and teaching efficiency. In Canada a half million was contributed to the medical school of Dalhousie University, Halifax. A million was added to the medical endowments of both McGill University, Montreal, and of the University of Toronto. The University of Manitoba, Winnipeg, received a half million for a similar purpose. Gifts of a million each have been pledged toward the important projects which are being carried out by Columbia University and the University of Chicago.

The essential features of the Foundation's policy with respect to co-operation in a program of development for a medical school are: (1) upon request a first-hand survey by representatives of the Division of Medical Education; (2) if favorable action is recommended, the formulation of a project which has the complete approval of the local authorities and leaves to them full administrative responsibility; (3) a promise by the Foundation to contribute a part of the sum needed, provided the rest is secured from other sources; (4) on the conditions being met, the payment of its pledge by the Foundation, whose relation to the undertaking thereby terminates.

The different ways in which the Foundation may come into relations with a medical school

vary from the making of an official visit to large gifts for buildings or endowments. Between these limits lie the sending of information about buildings, organization and administration, emergency provision of literature and laboratory supplies, temporary resident fellowships, the lending of experts, the training of teachers, and the making of appropriations for specific purposes. If all such contacts, services, and contributions be taken into account, the Rockefeller Foundation since its creation in 1913 has had direct relations with perhaps one quarter of all the medical schools of the world.

The Medical Schools of the World

A tentative list of the medical schools of all countries has been prepared by the Foundation. The geographical distribution of the 445 schools is indicated by the map on page 341. The United States has 82; next come the British Isles with 43, followed by France 32, Russia 28, Germany 25, China 24, Italy 21, Japan 20, India 18, Spain 11, Mexico 11, Brazil 10, Canada 9, Netherlands 8, Poland 5, Switzerland 5, Belgium 5. Fifty-four other countries support from one to four medical schools each. Not only do standards differ greatly between countries, but even within national areas, notably in the United States, medical schools are of distinctly different grades as

measured by personnel, equipment, resources, and ideals. In spite, however, of great variation in quality, all these centers of teaching are more or less directly dominated by the aims and methods of modern medicine. It is one aim of the Rockefeller Foundation to hasten the development of international co-operation in medical education by all available means.

Modern Medicine in China

To one medical school—the Peking Union Medical College—the Rockefeller Foundation through the China Medical Board sustains a unique relation. This institution, reconstructed upon foundations laid by a group of missionary societies in 1906, and administered by its own Board of Trustees, is entirely supported by the Foundation. This medical center is the chief feature of a program by which the China Medical Board seeks to promote scientific medicine in China. The important developments during 1922 were connected with premedical education. Offers were made to two Chinese institutions, Southeastern University, Nanking, and Nankai College, Tientsin, and to the missionary university in Peking, to contribute toward science laboratories and equipment, to lend visiting professors, to grant fellowships for further training of Chinese teachers, and to add to mainte-

nance funds. In previous years the Board made somewhat similar arrangements with St. John's University, Shanghai, Hunan-Yale School, Changsha, Fukien Christian University, Foochow, Ginling College, Nanking, and Canton Christian College. Because it is important for the success of the Peking Union Medical College that it should draw students from a wide range of preparatory schools and colleges, the Board has adopted a policy of aiding not only foreign but Chinese institutions.

In the Peking Union Medical College, in the premedical school, and in the nurse training school, the total registration of undergraduates in September, 1922, was 124. During the previous year fifty-eight graduate students registered for special courses or served as assistants. In addition to the courses conducted by the regular staff of forty-nine foreign and twenty-seven Chinese teachers, special instruction was given by distinguished visiting professors from the University of Vienna, Harvard, Northwestern, and Johns Hopkins Universities, and from the Rockefeller Institute for Medical Research. The cost of maintaining the College and its hospital for the year 1921–1922 was $547,533.

Hospitals well equipped, adequately staffed, and advantageously located are essential to the introduction of modern medicine in China.

Many missionary hospitals and a few under Chinese control are serving the cause not only by caring for patients, but by raising the professional and ethical standards of Chinese practitioners, and by educating the Chinese public in the meaning of scientific medicine. To come into closer and more sympathetic relations with the public, the Peking Union Medical College has recently appointed a co-operating committee of prominent Chinese to aid in interpreting the College to the community.

Recently the X-ray department of the Peking Union Medical College has helped a number of hospitals to install new equipment or to readjust old apparatus. The services of an advisory architect have been made available for hospital administrators. In 1922 the Board aided directly nineteen hospitals, of which one was Chinese. Since 1914 gifts totaling $690,920 have been made to thirty-two different hospitals. For all purposes the China Medical Board has since its organization disbursed $13,292,504.

While the Peking Union Medical College was being rebuilt a considerable number of fellowships for study abroad were granted to Chinese and to missionaries on furlough. But as soon as facilities for advanced study were available in 1921, fellowships were granted for study in Peking and aid for foreign study limited to

students who show capacity for advanced work which Peking cannot provide, or who are in training for influential teaching positions. Other activities of the Board have included grants for translating medical books into Chinese and for improving the journal of the China Medical Missionary Association, for office and secretarial field service, and for popular educational work.

The Foundation has so far almost wholly refrained from undertaking work in preventive medicine in China. The International Health Board's co-operation in a hookworm project at the Pinghsiang colliery in Central China served chiefly to demonstrate the difficulty of permanent accomplishment under existing conditions. The absence of stable and efficient central and provincial governments; popular ignorance of modern medicine; peculiar biological, social, and economic conditions; and the lack of trained personnel, make public health progress at present extremely difficult. The problem is not, however, being ignored. A member of the staff of the International Health Board is attached to the Peking Union Medical College, where he gives instruction to undergraduates in hygiene and public health, administers the health service of the College, conducts special courses in school hygiene, and spends part of his time in the field studying health conditions. With the gradual

growth of Western medicine in China, progress in public health may be expected.

Aid to European Medical Scientists

"We need food not only for our bodies but for our minds," wrote a Russian medical professor in acknowledging the receipt of periodicals and books provided by the Rockefeller Foundation. Save for a small contribution to a committee in Austria for food packages for medical scientists, the Foundation has left to other organizations the task of emergency relief and has concentrated efforts upon helping to maintain the continuity of scientific work by filling gaps in medical libraries, contributing apparatus and supplies to laboratories, supplementing the stipends of productive research men, granting fellowships for foreign study, and inviting commissions to make international visits.

During the years of the war, the medical libraries of Central Europe received almost no publications from the Allied countries, which in turn had only fragmentary information as to recent scientific progress in Germany and Austria. There was danger that valuable time and precious materials would be wasted upon unconscious duplication of results or that fruitful ideas would come to naught because they could not be related to others which would give them

significance. Primarily in the interest of modern medicine as an international product, the Rockefeller Foundation began in 1920 to assist in the distribution of British and American medical journals to European medical centers. Losses in exchange were made good and the pre-war purchasing power of library funds thus restored.

During 1922, journals to the number of 1,323 subscriptions were sent to 216 medical libraries in 12 different countries as follows: Austria 12, Belgium 6, Czechoslovakia 22, France 23, Germany 55, Hungary 3, Italy 30, Poland 38, Portugal 2, Roumania 2, Russia 2, and Jugoslavia 21. In a number of places committees of scientists arranged for the abstracting and circulating of periodicals and thus utilized them to the utmost.

The wearing-out of apparatus and the depletion of current supplies in scientific laboratories were inevitable results of the war. The medical schools of Vienna, Gratz, Budapest, Innsbruck, and Prague were among the first to suffer acutely. To these the Foundation made grants which were wisely and economically administered by local committees. Surveys made during 1922 showed that German and Polish laboratories were approaching the conditions from which Austria had suffered two or three years earlier. It was decided, therefore, to extend the scope of emergency laboratory aid.

Serious as were the problems of literature, equipment, and supplies, the question of personnel was absolutely vital. It was feared that the continuity of scientific progress might be interrupted, because young men either would be unable to go on with their studies or could not be trained to the old-time efficiency. To assist the Pasteur Institute of Paris to recruit and educate research assistants the Rockefeller Foundation pledged in 1921 the sum of $75,000 to be paid in three instalments during 1921, 1922, and 1923. Fellowships for foreign study (see page 56) have been awarded to men and women in Austria, Belgium, Czechoslovakia, England, France, Netherlands, Hungary, Jugoslavia, and Poland. Their appointment, training, and return undoubtedly had an encouraging influence on the maintenance of standards and the progress of medical science.

Until the autumn of 1922 it had not seemed necessary to grant fellowships to men for study in their own countries, but the plight of medical scientists in Germany and increased cost of research menaced the quality, if not the very existence, of German medical science. Representatives of the Foundation after a first-hand study recommended a program of emergency relief which was adopted by the trustees in December, 1922. Under this plan a committee of German

medical scientists will apportion to a group of exceptionally promising investigators and teachers sums of money to be supplied by the Foundation to be used for moderate increases of personal stipends and for necessary apparatus, supplies, books and periodicals. The German Government has agreed that this money shall be free from all taxes upon either institutions or individuals. Again it should be noted that this is not a project of general relief for a needy class, but a selective program in the interest of medical science throughout the world.

Medical Education and Public Health

The strengthening of medical schools, and emergency aid for medical scientists have a direct bearing upon the essential task of preventing disease, which is one of the leading ideals of scientific medicine. The dependence of this movement upon the knowledge, skill, and social spirit of the medical profession is too generally overlooked. Statistics of births, deaths, and sickness furnish the facts by which public health policies and procedures are guided. The data are supplied almost exclusively by practicing physicians. If they are competent diagnosticians and conscientious in making reports, the resulting statistics are trustworthy; otherwise they are incomplete and misleading.

If doctors are familiar with modern laboratory tests, they may not only safeguard their individual patients but by prompt notification of contagious diseases protect the community. The extent to which a public diagnostic laboratory is utilized is one index of the intelligence, alertness, and social-mindedness of the profession in the area which the laboratory serves. The success of campaigns to improve water and milk supplies, to reduce infant mortality, to make medical examinations of school children, to establish special clinics, to introduce or extend public health nursing is conditioned in large measure upon the attitude of local physicians.

It is immensely to the credit of the profession that doctors have been among the pioneers and leaders in the development of preventive medicine. They had the imagination and faith to realize that the chief purpose of medicine must be to keep people well, rather than to rest content with alleviating or curing diseases which might have been avoided. During the last fifty years scientific medicine has discovered the causes of many maladies and has learned how to protect individuals and communities against them. Many diseases formerly dangerous may now be discovered in their earliest stages and effectively controlled. Then, too, knowledge about the normal conditions of healthy living has so

increased that people may be measurably helped to maintain sound minds in sound bodies. Furthermore, practical methods of applying science to disease prevention have been elaborated so that not only striking reductions in death-rates but other evidences of positive well-being have been manifested. It is primarily to medical schools that society must look for the training of men and women who as the doctors of the future may be counted upon to preach and practice the gospel of health.

The Training of Health Staffs

Emphasis upon the preventive side of medicine in medical schools is gradually changing the attitude of the medical profession as a whole, but it cannot turn out public health administrators ready to head city and state departments of health. The too prevalent idea that any practicing physician is capable of discharging the duties of a health officer needs to be vigorously combated. Such a post ought to be filled by a person who in addition to a basic medical preparation has had specialized training for what has become a distinct profession. This training includes lecture courses and laboratory and field work in the causes of contagious diseases and methods of controlling them, in sanitary engineering, vital statistics, administration, and other subjects.

Only recently have special schools been organized to give training of this kind. The leaders in the public health movement have been doctors with sufficient imagination, character, and devotion to train themselves by the often wasteful method of trial and error. So little satisfied are they with the school of experience that they welcome heartily the new institutions.

The International Health Board has from the outset been impressed with the need for trained sanitarians. It has welcomed opportunities to co-operate in establishing schools of public health. During 1921 a request was received from the British Ministry of Health, to share in the creation of such a training center in London. Negotiations resulted in an agreement by the International Health Board of the Rockefeller Foundation to give $2,000,000 for land, building, and equipment for a school which the British Government has undertaken to maintain. A site on Gower Street near the British Museum and University College Medical School has been purchased, and a committee is at work upon a scheme of organization and plans for a building. This School of Hygiene in London will occupy a strategic position. For teaching purposes it will command the great scientific resources, public health records, and the well-trained experienced personnel of the unusually efficient health ser-

vices of Great Britain. By virtue of the position in the British capital, the new institution will exert an influence throughout the Empire. It seems likely, also, to serve as a training center for prospective health officers from many other nations. Similar institutions which have been assisted during recent years are the School of Hygiene and Public Health of Johns Hopkins University, the School of Public Health of Harvard University, and, on a smaller scale, institutes of hygiene in Prague and Warsaw, and a department of hygiene in the São Paulo medical school, Brazil. For all these enterprises the Foundation has appropriated or pledged nearly ten million dollars.

It will of course be many years before these professional schools can supply the demand for trained leaders. Many members of a specialized health department staff, such as statisticians, sanitary engineers, nurses, bacteriologists, laboratory technicians, and inspectors, will be prepared in other university departments, in special schools, or as apprentices in the service. Meantime a large number of men and women now in active health work must be given additional instruction in connection with their duties. Hence the organization of special local institutes for instruction and demonstration and for personal contact with well-known leaders. In 1922,

the Board contributed toward the expenses of such institutes in five states and continued to support an experimental correspondence course for local health officers, the success of which was sufficient to suggest the offering of a similar course for public health nurses.

Closing in on Yellow Fever

Definite progress was made during 1922 in the International Health Board's campaign to drive yellow fever from the world. The comparatively small number of reported cases of the disease were confined to Mexico, to a restricted area in northern Brazil, to points on the West Coast of Africa, or to ships en route from one of these countries. The Mexican authorities warmly welcomed and supported the co-operation of the Board. To one familiar with the history of yellow fever, the fact that for a whole year Central America, the West Indies, and all but one country of South America were free from the scourge which for nearly two centuries ravaged these regions, is strikingly significant. It is hard to realize that this latest phase of the fight on yellow fever began only five years ago.

The earlier stages of the campaign are well known. Following the discovery by Ross that malaria is transmitted by the mosquito, American Army medical officers, headed by Walter

Reed, in 1900 proved conclusively that yellow fever is spread only by the infected female Stegomyia mosquito. By depriving the Stegomyia of access to water in which to lay her eggs, and by screening houses against such mosquitoes as matured, General William C. Gorgas, first in Cuba and later in the Panama Canal Zone, achieved a notable control of yellow fever. Inspired by these triumphs, Dr. Oswaldo Cruz succeeded in ridding Rio de Janeiro of the disease, a feat soon emulated by Dr. Licéaga at Vera Cruz. In succeeding years yellow fever was gradually restricted to certain seed-beds whence from time to time it spread over considerable areas.

The fear lest the opening of the Panama Canal might carry yellow fever to the dense population of the Orient, and General Gorgas' faith that the menace might be entirely removed resulted in a decision of the Board to undertake a campaign of eradication. In 1916 General Gorgas visited Central and South America, made a report, and recommended systematic efforts to put an end to the disease in well-known endemic centers, such as Guayaquil in Ecuador, Merida in Yucatan, and an area in north Brazil. He also advised investigation of suspected foci in Venezuela and on the West Coast of Africa. Measures were promptly adopted. Dr. Hideyo Noguchi, of the Rockefeller Institute for Medical Research, made

investigations in Guayaquil and Merida, discovered the yellow fever germ and prepared a vaccine and a serum which have since given encouraging results. In November, 1918, a campaign was begun in Guayaquil with the result that since June, 1919, no case has been reported there. Meantime General Gorgas organized national yellow fever commissions in the chief countries concerned. Epidemics were checked in Central America. A serious outbreak in northern Peru was promptly controlled. General Gorgas was at the head of a commission on its way to West Africa when he died in London in July, 1920. Gradually the remaining sources of infection in the Caribbean region were traced to Mexico, and the Mexican Government invited the co-operation of the Board. It is too early to predict a complete victory, but the successors of General Gorgas share his faith that it will in time be won.

Controlling Malaria at Low Cost

The disease which in 1753 an Italian called malaria because he thought it came from "bad air" has a long and sinister history. It is believed that the ancient Egyptians knew it. Hippocrates clearly described it. The decline of Greece and Rome is attributed largely to malarial fevers. In 1640 cinchona bark was intro-

duced into Europe from Peru and was gradually employed as a specific remedy. Various medical men studied the disease and connected it with marshy areas. One suggested the possibility that the mosquito might be involved. In 1820 an alkaloid called quinine was obtained from cinchona bark. Knowledge about the malady grew until in 1880 Laveran, a French army surgeon, discovered the organism which causes malaria. Ross, in 1897, demonstrated the transmission of the malaria organism by mosquitoes. MacCallum's studies completed the knowledge of the life cycle of the parasite. Contributions from many other sources rapidly confirmed and expanded Ross's results. Experiments in control of mosquitoes by use of oil and larva-consuming fish were carried on. By 1910 a technique had been worked out for the prevention of malaria through drainage, screening, and other methods of mosquito control, and through the use of quinine.

Gorgas employed these methods in Panama. Ross, at Ismailia in Egypt, and Watson, in the Federated Malay States, achieved striking results. Italy introduced a wide distribution of quinine supplied free by the government. In 1912 the United States Public Health Service began studies and experiments in Mobile, Alabama, in conjunction with the State Department

of Health. The work was later extended to Louisiana. A demonstration was made in 1914–1916 in a cotton-mill town in North Carolina, following a successful effort to control malaria in a lumber camp in Mississippi. During the war the Public Health Service efficiently discharged the duty of protecting forty-three areas in the vicinity of army camps in fifteen states.

Practically all of these projects were directly supported by government. Many of them had to be carried through almost regardless of cost for the sake of industrial or military ends. The question as to whether a small city, a town, or a rural area could be protected against malaria at a cost which the local population could afford remained to be answered. It was to test the possibility of effective control at a low per capita expense that the International Health Board began in 1916, in co-operation with state and federal authorities, a series of demonstrations in small towns in Arkansas and Mississippi. The net result of these experiments was so encouraging, that for the season of 1920 widespread demonstrations were begun under the joint auspices of the local governments, state health departments, the United States Public Health Service, and the International Health Board. The program for 1922 included thirty-four countywide malaria control demonstrations and thirty-two

town demonstrations in ten states. All the demonstrations have afforded cumulative proof that under normal conditions an average community can practically rid itself of malaria at a per capita cost of from 45 cents to $1 per year. In addition, the Board conducted experiments in mosquito control by use of fish and by screening under a variety of conditions, and tested the curative and protective possibilities of quinine.

Hookworm Disease as an Educator

The relief of a disabling malady prevalent throughout areas inhabited by nine hundred million people of the world is sufficiently important in itself. But the control of hookworm infection has another and even more significant value. It is an effective means of educating people in the meaning of public health work and of persuading them to support more comprehensive measures for preventing other diseases as well. For the facts about hookworm disease are fairly simple and easy to understand. Even an illiterate person may with the aid of charts, pictures, microscope, and oral explanation follow the course of the tiny, burrowing larva as it makes its way from the soil where it has hatched from an egg, through the skin of a man into the blood, which carries the parasite into the lungs. From there it penetrates to the throat, is swal-

lowed into the digestive tract, and at last burying its hooks in the walls of the intestine, clings to its host, impoverishing his blood and robbing him of vitality. The eggs which the worms lay pass out to infect the soil and to start another life cycle. The method of administering a vermifuge by which the parasites may be eliminated is simple. The worms themselves may be put under the microscope to convince the sceptical. This device, to be sure, is not universally successful. In the remote regions of a foreign country, for example, a doubting observer refused to admit the actuality of the squirming organisms. "At the cinema," he said, "I see lions and tigers, but they are not really there." Not only the cure, but the prevention of hookworm disease through sanitation and latrines can be made clear and convincing. Experience with anti-hookworm campaigns in many countries has proved that the disease can readily be used as a means of educating the public in the possibilities of preventive medicine.

In the year 1922 the International Health Board had a part in hookworm control activities in twenty-two governmental areas in the United States, the West Indies, Central America, South America, and the Far East. Since 1911 the Board has co-operated in sixty-nine states and countries. In fifty-four, control measures were

carried out; in fifteen others only surveys were made. The policy of the Board in this work has been: (1) to undertake control measures only on the invitation of a government which (2) bore from the first at least a small part of the expense, and agreed (3) to take on each year an increasing proportion of the cost until it finally (4) assumed entire responsibility for the continuance of the project. In order to measure the progress of control the Board in the last three years made re-examinations of school children in sixty-six counties in the Southern States and compared results with those of the original surveys, which were made between 1910 and 1914. On the average a reduction of 47.5 per cent was shown. In one county a decrease of 94 per cent had taken place; in several, over 80 per cent; in only one was an increase disclosed.

Simple and well-understood as hookworm control may seem to be, the fact is that new knowledge is constantly leading to the adoption of new methods. The Board's staff in the field constitutes in a true sense a body of research workers who are always on the alert for information and improved methods. From time to time experts are sent out to make special studies which throw new light on the problems of sanitation, treatment, and education. Important field studies in Trinidad and Porto Rico show that hookworm

larvae cannot travel far through the soil and do not live more than six weeks. This localizing of infection and self-sterilizing of the soil have a fundamental bearing on the problem of sanitation.

The County as a Health Unit

Hookworm control has been so successful as an educator of the public that it has ceased to be a separate project in the United States and has become one item in a larger undertaking organized as a task of local government. Two hundred and fifteen counties in this country and six similar areas in two states of Brazil now have full-time county health departments. This rural health work reaches all parts of the county through control of contagious diseases, visiting nurses in homes and schools, medical examination of children, sanitary inspection, special clinics, and by health education for old and young. The typical staff is made up of four whole-time workers—a health officer, a nurse, a sanitary inspector, and a clerk. The usual cost of this service is about $10,000 per year. Many populous and well-to-do counties spend more; a few get on with less.

Comparisons of relative declines in urban and country death-rates in recent years, the contrast disclosed by physical examination of city and country children, and studies of sanitary condi-

tions on farms, all revealed disquieting tendencies. The idyllic myths about the pure water of the old oaken bucket, the salubrious country air, the invigorating exercise of bucksaw, spade, and hoe, had to be rudely revised in the light of facts. The health program is only one item, but an essential item, in the national effort to make country life wholesome, happy, and rewarding to the millions who produce the food and staples of the whole population.

During 1922 the Board gave money to the health budgets of 163 counties in the United States and of six counties in Brazil. In most cases the Board's share in budget and responsibility is being gradually transferred to state and county. The gradual spread of the county health unit idea is based upon the sound principle of local support with only partial and usually temporary aid from central departments and voluntary agencies. There is a temptation to impose from above a system and to maintain it by large government subsidies or private gifts. Up to a certain point such stimulus and guidance may be useful but the danger is that the project will not take root in the local life. In a democracy permanent progress depends upon the slow process of convincing whole communities and getting them to recognize an activity as a collective duty. The Board seeks not to take the

place of government agencies but to help them educate their constituencies to recognize that a given health project is desirable, feasible, and economically possible.

Promoting International Hygiene

Not only is the scientific basis of preventive medicine an international product, but the application of it has called for increasing co-operation among the countries of the world. The first European conference to consider health problems was held in 1851. Twelve nations were represented. Concerted measures against cholera, plague, and yellow fever were adopted. Thereafter at intervals of a few years other congresses were called to insure better teamwork in preventive medicine. In 1902 an International Sanitary Bureau was established in Washington by the Pan American Union. Finally in 1908 a permanent International Office of Hygiene was established in Paris under the auspices of thirteen nations. Voluntary associations have also a part in this common battle against disease. The League of Red Cross Societies, with headquarters in Paris, includes public health activities in its international program. The medical congresses already mentioned have had an important bearing on the spread of public health knowledge and practice. The work of the Rockefeller

Foundation which is described in this Review lies largely in the field of international hygiene.

The most significant development in this movement is the recent creation under the League of Nations of a Health Organization which has the direct support of fifty-two nations and the sympathetic co-operation of the United States. The new body has reached a working agreement with the International Office of Hygiene in Paris and will doubtless have cordial relations with the International Sanitary Bureau. The program of the League's Health Organization includes the gathering of vital statistics, prompt notification of epidemics, standardizing of vaccines and sera, international conferences and exchanges of health officers, securing of better health conditions for sailors on shipboard and in ports, co-operation with League mandatories, with the Commission on Opium, and with the International Labor Office.

The International Health Board has made appropriations to the League of $344,440, to be used over a period of three to five years in a demonstration of the feasibility and value of an international epidemiological service and an international exchange of health officers. The first of these interchanges of health officers has taken place. Sanitary officials of Belgium, Bulgaria, Czechoslovakia, Italy, Jugoslavia, Poland,

and Russia to the number of twenty-one met in Brussels October 8, 1922. After a series of lectures, conferences, and demonstrations the officers visited various health districts in Belgium. Then they went to Italy, where a similar plan was carried out. The whole program lasted for about ten weeks. It is expected that these interchanges between different countries will take place three or four times a year and will promote efficiency and a sense of professional comradeship across national boundaries.

Advanced Students from Twenty-Three Countries

Mention has been made in the foregoing pages of the fellowships in public health, medical education, and nursing by means of which the different agencies of the Rockefeller Foundation are providing advanced training for men and women who are preparing themselves for careers in these fields. During 1922 the total number of fellowship holders was 237. Of these, 164 were appointed directly through departments of the Foundation, while seventy-three were selected and supervised by special committees of the National Research Council. The list does not include 105 fellows studying at the Peking Union Medical College, nor *bourses* for 157 health visitors in France and for 7 French nurses in London hospitals. The International Health

Board granted 79 fellowships, the China Medical Board 63, and the Division of Medical Education 22. Twenty-three countries were represented in these three groups, as follows: China 64, Brazil 20, Czechoslovakia 16, United States 12, Poland 10, Canada 8, Philippine Islands 4, Australia 3, Austria 3, Hungary 3, Nicaragua 3, Syria 3, Colombia 2, Japan 2, Jugoslavia 2, Siam 2, Ceylon 1, Costa Rica 1, England 1, Mauritius 1, Mexico 1, Peru 1, Salvador 1. Of the 73 American fellowships administered by the National Research Council, 29 were assigned to chemistry, 26 to medicine, and 18 to physics. From its inception in 1915 to December 31, 1922, 431 fellows have studied under this fellowship plan.

The fellowship policy of the Foundation aims at flexibility, selection, and specific preparation. No fixed number of fellowships is assigned to any one subject or country. Only candidates of exceptional promise are chosen, to whom positions in government or institutional service have been assured on the completion of their studies. The International Health Board, in helping to create institutes of hygiene in Prague and Warsaw, grants fellowships for the training of the staffs of the new schools. In the same way the China Medical Board prepares Chinese to assume teaching responsibilities in the Peking

Union Medical College and other schools in China, and the Division of Medical Education will educate future professors in the reorganized Royal Medical College, Bangkok, Siam. The Foundation's experience shows that progress in its chosen fields is limited chiefly by lack of capable, well-trained personnel. The fellowships are being used to overcome this obstacle.

Working Through Non-Governmental Organizations

The plan of co-operation with governments has been emphasized. The Foundation also works with voluntary institutions and organizations of many kinds. From time to time temporary committees are created for special tasks. To these and to more permanent organizations the Foundation makes contributions for specific purposes and for limited periods. Occasionally aid is given for a test of some project with the understanding that if it proves successful it will be supported by funds from other sources. During the year 1922 the Foundation has co-operated directly and through its Boards with the following agencies which work in the fields of medical education and public health:

French Health Agencies. The International Health Board in withdrawing its antituberculosis commission from France has transferred to the

Comité National de Défense contre la Tuberculose and to five nurse training schools certain functions and temporary appropriations. Since the commission began its work in France in 1917, it has co-operated in the establishment of more than 300 dispensaries, provided special courses for 228 doctors, helped to train 289 health visitors, carried on educational work in sixty-five departments, and expended a total of $2,119,945.

Committee for the Study of Nursing Education. Under the auspices of this Committee, named in 1919 by a conference representing all phases of opinion on the problem of nurse training, a thorough study of the functions and education of both bedside and public health nurses has been made by Miss Josephine Goldmark. The Foundation called the original conference and paid the expenses of the survey, but did not participate in the work and is not responsible for the recommendations, which may be summarized as follows: (1) the public health nurse should have a training equivalent to, but not identical with, that of the bedside nurse; (2) present standards of knowledge and efficiency should be maintained; (3) a subsidiary grade of nursing service should be provided, under careful restrictions; (4) the status, equipment, and teaching personnel of the nurse training school should be improved and the pupil nurses relieved of

hospital drudgery; (5) the course should be shortened from three years to twenty-eight months; and (6) university schools of high grade for the training of leaders, i. e., teachers and administrators, should be developed.

Committee on Training of Hospital Executives. Appointed at a conference called by the officials of the Rockefeller Foundation, this Committee asked Dr. Willard C. Rappleye, now superintendent of the New Haven Hospital, to make a study and prepare a report. This was published in April, 1922. It shows (1) the need, as a basis for the training of superintendents, of an understanding of the place and functions of the modern hospital; (2) the duty of the hospital with respect to the prevention as well as the cure of disease; and (3) the intimate relation which the hospital should sustain to the community it serves.

Committee on Dispensary Development, New York City. Appointed by the United Hospital Fund and supported by the Foundation, this Committee has sought to (1) demonstrate improvements in dispensary service, (2) increase the interest of the medical profession and laymen, and (3) stimulate financial support for new projects. Plans for co-operation with the Presbyterian Hospital were developed, field studies have been made, local stations for health examinations established. The outstanding feature of this Committee's program is:

The Cornell University Pay Clinic, which undertakes to furnish a high grade of medical service at fees which can be met by individuals and families unable to afford the usual private rates for the medical service which their conditions require. The clinic aims to be self-supporting except so far as teaching requirements for students are concerned. In the year ending October 31, 1922, 22,536 different individuals paid 114,108 visits to the clinic. During the first ten months of the demonstration 719 physicians referred 1,110 patients to it. While the point of complete self-support has not been reached, it is believed that with some readjustments in plan and rates the budget can be balanced. The need and demand for service of this kind have been demonstrated.

National Committee for Mental Hygiene. Besides contributing to the general budget of this organization, the Foundation made special appropriations for the support of surveys and uniform statistics of mental deficiency and mental diseases.

Hospital Library and Service Bureau, Chicago. A small contribution was made to this agency which disseminates information with regard to hospital construction, equipment, organization, administration, relation to the community, and so forth.

National Research Council, Washington. Cer-

tain fellowships supported by the Foundation are administered by special committees of the Council (see page 56). The Foundation is also contributing through the Council for a transition period to the budget of the Concilium Bibliographicum of Zürich, which it is hoped will become a part of a comprehensive international bibliographical service.

American Medical Association. The Foundation shares with the Association the annual deficit involved in the publication of a Spanish edition of the *Journal of the American Medical Association* for circulation in Spanish-speaking countries.

In fulfilment of ten-year pledges made in its early years appropriations were continued to certain institutions whose work no longer falls within the scope of the Foundation's program. Those appear in the summary of appropriations for 1922 on page 80.

Applications for Aid

During 1922, applications to the Foundation for aid numbered 835. This total does not include a large number of appeals made to the departmental agencies within their own fields. The lists of individuals and organizations whose requests have been declined either by the officers or the Executive Committee are laid before the trustees, but it does not seem courteous or just

to make these details public. The Foundation has consistently adhered to the policy of declining to make gifts or loans to individuals, to invest in securities which have a philanthropic rather than a business basis, to assist in securing patents or aiding altruistic movements which involve private profit, or to support propaganda which seeks to influence public opinion on social, economic, or political questions.

TABLE 1: APPLICATIONS FOR AID RECEIVED AND ACTED UPON DURING 1922

Classification	RECEIVED	GRANTED	DECLINED	PENDING
1. Public Health	77	2	74	1
2. Medical and nursing education and subsidization of medical research (including granted fellowships)	171	40	125	6
3. General education (including educational projects and research other than medical)	83		82	1
4. Foreign relief or reconstruction	37		37	
5. National movements in fields other than 1 and 2	11		11	
6. Campaigns to influence public opinion	17		17	
7. Local churches and institutions	133		132	1
8. Personal aid (including loans, gifts, medical treatment, education)	153		153	
9. Financing or promotion of books, plays, inventions, etc.	50		50	
10. Investigation, reward or purchase of alleged medical discoveries	67		67	
11. Miscellaneous	36		36	
TOTAL	835	42	784	9

Finances for 1922

The following table presents a summary of receipts and expenditures for the fiscal year 1922:

TABLE 2: RECEIPTS AND DISBURSEMENTS IN 1922

Receipts		*Expenditures*		
Balance from 1921	$7,359,001	Public Health		$9,447,270
Refunds on appropriations	6,960	Medical Education		6,103,130
Income during 1922	8,836,309	Miscellaneous		191,966
Appropriated from principal fund	6,000,000	Administration		169,042
				$15,911,408
		Balance		
		Payable on 1922 and prior appropriations	$4,377,427	
		Available for 1923 appropriations	1,913,435	6,290,862
	$22,202,270			$22,202,270

The balance of more than seven millions carried over from 1921 included refunds on appropriations of 1922 and previous years which were not all called for. Every effort is made to forecast the sum needed for each activity in a given year, but it often happens that the entire amount set aside is not used. At the end of the year such unexpended remainders are returned to the treasury. In the aggregate these refunds amount to a considerable sum. The income for 1922 approached nine millions, but even these combined resources were inadequate. The trustees voted therefore to spend six millions from

the principal funds. Thus the total amount available for disbursement was more than twenty-two millions, of which almost sixteen millions were paid out. Of the remainder, nearly four and one half millions were mortgaged by outstanding obligations, leaving almost two millions for use in 1923 in addition to the income for that year. Of the sixteen millions disbursed twelve millions were for buildings and endowment, and four millions for the operating or current expenses of the institutions aided. A table on pages 76 to 78 gives an analyzed statement of the total expenditures of the Foundation for its first ten years, ending December 31, 1922. On pages 79 to 81 are summaries of expenditures for the year 1922 and of funds and property.

The Well-Being of Mankind Throughout the World

The foregoing pages have described the movement for scientific medicine and public health from an international standpoint. It must be owned that there is today a suggestion of irony in smooth phrases about co-operation, understanding, and good-will among the nations. Suspicion, distrust, detraction, hatred, and threat of war are all too prevalent in the relations of the peoples of the world. Scientific comradeship and common tasks of hygiene seem

almost negligible as bonds of unity. But the difficulty of a task is no excuse for not attempting it. Because it is not possible to predict the early dawn of a millennial peace, there is no good reason for not taking steps which seem to lead toward even a remote era when nations may substitute generous rivalry for deadly conflict. To stimulate worldwide research, to aid the diffusion of knowledge, to multiply personal contacts, to encourage co-operation in medical education and public health are the means by which the Rockefeller Foundation seeks to be true to its chartered purpose, which is to promote, not the exclusive prosperity of any one nation, but "the well-being of mankind throughout the world."

THE ROCKEFELLER FOUNDATION

Report of the Secretary

THE ROCKEFELLER FOUNDATION

Report of the Secretary

To the President of the Rockefeller Foundation:

Sir:

I have the honor to submit herewith my report on the activities of the Rockefeller Foundation for the period January 1, 1922, to December 31, 1922.

Respectfully yours,

EDWIN R. EMBREE,

Secretary.

SECRETARY'S REPORT

The review by the President outlines the policies by which the Rockefeller Foundation is being guided in its work, sketches its present program, and describes the results aimed at and accomplished during the year 1922. The following report depicts the organization and the agencies through which these results were reached, and outlines the methods by which the programs of the several departments were carried out.

Organization

The following are the members and officers of the Rockefeller Foundation for 1923:

[1] Resigned July 2, 1923.

OFFICERS

John D. Rockefeller, Jr.	*Chairman, Board of Trustees*
George E. Vincent	*President*
Edwin R. Embree	*Secretary*
Norma F. Stoughton	*Assistant Secretary*
L. G. Myers	*Treasurer*
L. M. Dashiell	*Assistant Treasurer*
Robert H. Kirk	*Comptroller*
Chase Andrews	*Assistant Comptroller*
C. C. Williamson	*Director of Information Service*

The Foundation holds regular meetings in February, May, and December. The executive committee meets frequently during the intervals to execute programs within general policies approved by the trustees. Eighteen meetings of the executive committee were held during 1922.

Departmental Agencies

The Foundation accomplishes its work largely through departmental organizations that are devoted to special functions and depend upon the Foundation for funds. These with their members and officers are:

INTERNATIONAL HEALTH BOARD

George E. Vincent, *Chairman*

Hermann M. Biggs[1]	Vernon Kellogg
Wallace Buttrick	T. Mitchell Prudden
David L. Edsall	John D. Rockefeller, Jr.
Simon Flexner	Wickliffe Rose
Raymond B. Fosdick	Victor C. Vaughan
Frederick T. Gates	William H. Welch
Edwin O. Jordan	

Edwin R. Embree, *Secretary*
Florence M. Read, *Assistant Secretary*

[1] Deceased June 28, 1923.

F. F. Russell, M.D.	*General Director*
John A. Ferrell, M.D.	*Director for the United States*
Victor G. Heiser, M.D.	*Director for the East*
H. H. Howard, M.D.	*Director for the West Indies*

Edwin R. Embree, *Secretary*
Margery K. Eggleston, *Assistant Secretary*

Roger S. Greene	*Director*
Henry S. Houghton	*Acting Resident Director in China*

DIVISION OF MEDICAL EDUCATION

Richard M. Pearce, M.D., *General Director*
Alan Gregg, M.D., *Associate Director*

Assistance to Other Agencies

In addition to the work carried out through the departmental organizations described above, the Rockefeller Foundation has contributed during the year to the accomplishment of work undertaken by other and unaffiliated organizations.

An analyzed statement of the total expenditures of the Foundation for its first ten years, ending December 31, 1922, is given on pages 76 to 78. On pages 79 to 81 will be found a summary of payments made by the Rockefeller Foundation for all purposes during the year 1922. This tabular summary outlines, in terms

of expenditures, the work described in terms of aims and results in the President's Review. In many instances these payments involved sums expended on account of appropriations made in former years. On the other hand, they represent in some instances but partial payments on many of the appropriations, made during 1922, which will provide for continuing work during succeeding years. For a full statement of the finances of the Foundation, see the Report of the Treasurer, pages 355 to 419.

TABLE 3: SUMMARY OF THE EXPENDITURES OF THE ROCKEFELLER FOUNDATION FROM MAY 22, 1913, TO DECEMBER 31, 1922

PUBLIC HEALTH		
International Health Board		
Regular Program in Control of Hookworm, Malaria, and Yellow Fever, and in County Health and Laboratory Service	$5,600,989	
Tuberculosis in France	2,119,945	
Fellowships and Public Health Education	348,952	
Administration	777,683	
	$8,847,569	
Schools of Public Health		
Johns Hopkins University	7,096,088	
Harvard University	1,250,534	
	$8,346,622	
Hospital, Dispensary, and Nursing Studies and Demonstrations	$313,502	
Mental Hygiene	390,227	
Social Hygiene	41,353	
Infantile Paralysis including Gift to New York City Department of Health	154,565	
Other Public Health Education and Demonstrations	95,000	
	$994,647	
		$18,188,838

MEDICAL EDUCATION		
China Medical Board		
Regular Program of Aid to Medical and Pre-medical Schools and to Hospitals	$1,566,230	
Fellowships and Scholarships	265,141	
Peking Union Medical College, Land, Buildings, and Equipment	8,513,882	
Operation	2,059,094	
Shanghai Medical School, Land and Expenses	346,937	
Administration	541,220	
	$13,292,504	
Belgium—Fondation Reine Elisabeth	80,972	
Canada—Alberta, Dalhousie, Manitoba, McGill, and Toronto Universities, and Université de Montréal	2,336,387	
England—London Medical Center	4,690,215	
France—Pasteur Institute	55,000	
Central Europe—Laboratory Equipment and Scientific Journals	125,394	
Hongkong—University of Hongkong	293,750	
United States		
University of Chicago[1]	190,281	
Rockefeller Institute for Medical Research.	3,422,043	
Studies in Medical Education, Visiting Commissions and Exchange Professors	155,715	
Fellowships for Medical Scientists	51,372	
Administration—Division of Medical Education	23,226	
	$11,424,355	
		$24,716,859
WAR WORK		
Y. M. C. A., Knights of Columbus, Jewish Welfare, Y. W. C. A., and Other Camp and Community Welfare	$10,956,298	
Medical Research and Relief	678,084	
Humanitarian Aid including American and International Red Cross	10,664,159	
		22,298,541

[1] Assistance to medical education as well as to other education in the United States is a part of the work of the General Education Board, which is a separate corporation and has made contributions to many American medical schools. The Foundation has at the initiative of that Board joined with it in pledges to medical schools of the universities of Chicago, Columbia, and Iowa. To December 31, 1922, payments have been made only on the pledge to Chicago.

BIOLOGY, PHYSICS, AND CHEMISTRY.		$263,906
FOUNDER'S DESIGNATIONS[1]		
Gifts made during the period May 22, 1913 to July 19, 1917, upon the designation of Mr. Rockefeller		5,678,599
MISCELLANEOUS		
Palisades Interstate Park	$1,000,000	
American Relief Administration Feeding of European Children	1,000,000	
American Red Cross—Other than War Work	110,000	
American Academy in Rome	90,000	
Bird Refuge presented to the State of Louisiana	256,133	
Bureau of Municipal Research, 1914–1919	173,000	
Scientific Studies in Governmental Problems, 1914–1918	127,500	
Colorado State Committee on Unemployment, 1915	99,985	
Mayor's Committee on Unemployment in New York City, 1915	10,000	
Studies in Industrial Relations, 1914–1918	56,159	
Committee of Reference and Counsel of the Foreign Missions Conference of North America	423,880	
New York Association for Improving the Condition of the Poor	295,000	
Wellesley College—Buildings,[2] 1915–1916	750,000	
Other gifts, in no case over $10,000, not included in above classifications	56,000	
Office Furniture and Books for Library	55,466	4,503,123
ADMINISTRATION		1,107,174
		$76,757,040

[1] In connection with an early gift the Founder reserved the right to designate charities, within the chartered purpose of the Foundation, to which a part of the income should go. This right was formerly relinquished in 1917, since which time no payments on account of such designation have been made.

[2] The gift to Wellesley, as most of the others included in the classification "miscellaneous," was made in the early years of the Foundation before the present policy of concentrating upon definite fields of activity had been adopted. Gifts to educational institutions within the United States are a part of the program of the General Education Board, which is a separate corporation; they are not now regarded as within the scope of the Rockefeller Foundation.

NOTE: In addition to figures reported above, the Foundation has paid out to specially designated charities income amounting to $4,850 annually on funds held for the time being in trust for Mr. and Mrs. Rockefeller. The residuary estate of Mrs. Rockefeller received by the Foundation, amounting to $487,689, has been paid out in full in appropriations to the General Education Board, the Young Men's Christian Association, and the Fifth Avenue Baptist Church of New York City.

TABLE 4: SUMMARY OF THE EXPENDITURES OF THE ROCKEFELLER FOUNDATION FOR THE YEAR 1922

I. PUBLIC HEALTH	
A. International Health Board	
1. Regular program in control of Hookworm, Malaria, and Yellow Fever, and in County Health and Laboratory Service	$1,287,017
2. Tuberculosis in France	230,198
3. Fellowships and Public Health Education	154,250
4. Administration	170,912
B. Studies and Demonstrations	
1. Mental Hygiene	64,083
2. Hospital, Dispensary Service, and Nursing	141,657
C. Schools of Public Health	
1. Johns Hopkins University	6,165,118
2. Harvard University	1,209,034
D. Other Public Health Education and Demonstrations	
1. New York University—Hygiene Laboratory	25,000
2. Common Service Committee—(For Correlation of Service of Health Agencies)	5,696
3. National Health Council	10,000
	$9,462,965

II. MEDICAL EDUCATION	
A. China Medical Board	
1. Regular program of aid to Medical and Premedical Schools and to Hospitals	$217,417
2. Peking Union Medical College	
(a) Buildings and Equipment	219,741
(b) Operation	623,944
3. Fellowships and Scholarships	30,510
4. Administration	115,302
B. London Medical Center	3,689,293
C. Canadian Medical Program	658,784
D. Hongkong Medical School	293,750
E. Central Europe: Journals and Apparatus	78,308
F. Pasteur Institute	25,000
G. University of Chicago—Interest on pledge	47,706
H. Fellowships for Medical Scientists	30,167
I. Assistance to Medical Schools in Brazil	13,828
J. American Medical Association (Toward publishing Spanish Edition of Journal)	7,782

K. Studies in Medical Education, Visiting Commissions and Exchange Professors	$ 28,373
L. Administration—Division of Medical Education	23,226
	$6,103,131

III. MISCELLANEOUS

(Chiefly payments on previous pledges)	
A. American Academy in Rome—(Payment on ten-year pledge made in 1914)	$10,000
B. Committee of Reference and Counsel of the Foreign Missions Conference of North America (Payment on ten-year pledge made in 1914)	30,000
C. Concilium Bibliographicum, Zürich	27,914
D. National Information Bureau—(Membership for 1922)	1,000
E. National Research Council—(Fellowships in Physics and Chemistry)	82,260
F. New York Association for Improving the Condition of the Poor—(Ten-year pledge made in 1914)	20,000
G. Johns Hopkins University—(For Special Investigations)	750
	$171,924

IV. ADMINISTRATION

A. Maintenance of Executive Offices and Treasurer's Office	$169,042
B. Furniture and Fixtures, and Books	4,346
	$173,388
	$15,911,408

Funds and Property

As of December 31, 1922

PRINCIPAL FUNDS		
General Fund		$165,204,624
Special Funds:		
Gifts of Laura S. Rockefeller	$49,300	
Gifts of John D. Rockefeller	37,000	
Henry Sturgis Grew Memorial Fund	25,000	
Arthur Theodore Lyman Endowment	5,500	116,800
		$165,321,424

LAND, BUILDINGS, AND EQUIPMENT

In China: Medical School Lands, Buildings, and Equipment	$8,850,106	
In New York: Furniture and Equipment of Offices	39,326	$8,889,432

UNDISBURSED INCOME

General Income (For offsetting liabilities see below)		$6,290,862
Special Income Accounts:		
Estate Laura S. Rockefeller	$65	
Henry Sturgis Grew Memorial	5,665	
Arthur Theodore Lyman Endowment	1,041	6,771
		$6,297,633

UNPAID APPROPRIATIONS AND PLEDGES

Balance due on appropriations payable in 1922 and prior years		$4,377,427
Appropriations and pledges which become effective in 1923 and following years:		
1923	$9,717,521	
1924	2,683,933	
1925	1,131,846	
1926	1,941,309	
1927	135,260	15,609,869
		$19,987,296

INTERNATIONAL HEALTH BOARD

Report of the General Director

INTERNATIONAL HEALTH BOARD

Report of the General Director

INTERNATIONAL HEALTH BOARD

Report of the General Director

To the President of the Rockefeller Foundation:

Sir:

I have the honor to submit herewith my report as General Director of the International Health Board for the period January 1, 1922, to December 31, 1922.

Respectfully yours,

WICKLIFFE ROSE,

General Director.

INTERNATIONAL HEALTH BOARD

OFFICERS AND MEMBERS

GEORGE E. VINCENT, *Chairman*
WICKLIFFE ROSE,[1] *General Director*
HERMANN M. BIGGS[2]
WALLACE BUTTRICK
SIMON FLEXNER
RAYMOND B. FOSDICK
FREDERICK T. GATES
EDWIN O. JORDAN
VERNON KELLOGG
T. MITCHELL PRUDDEN
JOHN D. ROCKEFELLER, JR.
VICTOR C. VAUGHAN
WILLIAM H. WELCH

EDWIN R. EMBREE, *Secretary*
FLORENCE M. READ, *Assistant Secretary*

[1] See footnote 2, p. 87.
[2] Deceased June 28, 1923.

PERSONNEL OF STAFFS DURING 1922[1]

ADMINISTRATIVE STAFF

WICKLIFFE ROSE,[2] *General Director*
JOHN A. FERRELL, M.D., *Director for the United States*
VICTOR G. HEISER, M.D., *Director for the East*
HECTOR H. HOWARD, M.D., *Director for the West Indies*
L. W. HACKETT, M.D., *Associate Regional Director (for Brazil)*
FREDERICK F. RUSSELL, M.D.,[2] *Director of Public Health Laboratory Service*

FIELD STAFF

ANTIGUA

D. L. SISCO	Hookworm resurvey

AUSTRALIA

(including Papua and Late German New Guinea)

W. A. SAWYER	Consultant in Public Health to the Commonwealth Department of Health
W. C. SWEET	Hookworm control
A. J. LANZA[3]	Industrial Hygiene
F. F. LONGLEY[3]	Sanitary Engineering

BRAZIL

L. W. HACKETT	Direction of work in Brazil and Paraguay
G. K. STRODE	Hookworm control
ALAN GREGG (resigned)	Hookworm control
F. L. SOPER	Hookworm control
N. C. DAVIS	Hookworm control
J. H. JANNEY	Organization of county health departments
M. F. BOYD	Malaria surveys
E. H. MAGOON[3]	Malaria surveys

[1] Personnel employed by Government in co-operative work not listed.
[2] Dr. Russell became General Director on March 1, 1923, when Dr. Rose became President of the General Education Board and the International Education Board.
[3] Special Staff Member.

Mrs. Ethel Parsons [1]	Public health nursing service
W. G. Smillie	Director and Professor of Hygiene, School of Hygiene and Public Health, São Paulo

BRITISH HONDURAS

E. I. Vaughn	Yellow fever control

BRITISH NORTH BORNEO

C. H. Yeager	Hookworm control

CEYLON

W. P. Jacocks	Hookworm control
J. F. Docherty	Hookworm control
G. G. Hampton	Hookworm control
C. N. Leach	Hookworm control

CHINA

J. B. Grant	Associate Professor of Hygiene and Public Health, Peking Union Medical College Public Health Surveys

COLOMBIA

F. A. Miller	Hookworm control
W. M. Monroe	Hookworm control

CZECHOSLOVAKIA

S. M. Gunn [1]	Public health administration

DUTCH GUIANA

W. C. Hausheer	Hookworm control

FIJI

S. M. Lambert [1]	Hookworm control

FRANCE

L. R. Williams [1] (resigned)	Commission for the Prevention of Tuberculosis in France
Miss F. Elisabeth Crowell [1]	Commission for the Prevention of Tuberculosis in France
S. M. Gunn [1]	Commission for the Prevention of Tuberculosis in France

[1] Special Staff Member.

GUATEMALA

E. I. Vaughn	Hookworm control Yellow fever control
J. E. Elmendorf, Jr.	Hookworm control Yellow fever control

HONDURAS

D. B. Wilson	Hookworm control

INDIA

J. F. Kendrick	Hookworm control

JAMAICA

B. E. Washburn	Hookworm control
D. L. Sisco	Hookworm control

MAURITIUS

G. G. Hampton	Hookworm control

MEXICO

J. H. White [1]	Yellow fever control
M. E. Connor	Yellow fever control
B. W. Caldwell [1]	Yellow fever control
E. J. Scannell [1]	Yellow fever control
W. M. Monroe	Yellow fever control

NICARAGUA

D. M. Molloy	Organization of public health activities Hookworm control Yellow fever control
F. E. Hulse [1]	Malaria control investigations
E. M. Knights [1]	Public health laboratory service

PALESTINE

P. S. Carley	Malaria survey
J. J. Mieldazis	Malaria survey

PANAMA

F. C. Caldwell	Hookworm control

PHILIPPINE ISLANDS

C. N. Leach	Public health administration
W. D. Tiedeman [1]	Malaria survey

[1] Special Staff Member.

Miss Alice Fitzgerald [1]	Public health nursing service

PORTO RICO

R. B. Hill	Hookworm control
J. L. Rice [1]	Hookworm control
H. W. Green [1]	Malaria control investigations

SALVADOR

C. A. Bailey	Hookworm control Yellow fever control

SIAM

M. E. Barnes	Hookworm control
H. R. O'Brien	Hookworm control

TRINIDAD

J. L. Rice [1]	Hookworm control
J. L. Hydrick	Hookworm control

UNITED STATES

Alabama

W. G. Smillie	Organization of county health departments Direction of training base
N. H. Rector [1]	Co-operative Demonstration in Malaria Control
H. W. Nightingale [1]	Co-operative Demonstration in Malaria Control
M. C. Balfour [1] (resigned)	Co-operative Demonstration in Malaria Control
A. S. Bedell [1] (resigned)	Co-operative Demonstration in Malaria Control

Arkansas

H. A. Johnson [1]	Co-operative Demonstration in Malaria Control

California

P. W. Covington	Organization of county health departments
L. G. Lenert [1]	Malaria surveys

Illinois

P. W. Covington	Organization of county health departments

[1] Special Staff Member.

J. J. Mieldazis [1]	Co-operative Demonstration in Malaria Control

Indiana

G. P. Paul (resigned)	Organization of county health departments
J. L. Hydrick	Organization of county health departments

Kansas

P. W. Covington	Organization of county health departments
A. J. Warren	Organization of county health departments
Louis Schapiro	Organization of county health departments

Kentucky

P. W. Covington	Organization of county health departments

Louisiana

P. W. Covington	Organization of county health departments
Hugo Muench, Jr. [1]	Organization of county health departments Malaria control investigations
L. J. Petritz (resigned)	Malaria control investigations
J. J. Mieldazis [1]	Malaria control investigations
A. R. Wingate [1]	Co-operative Demonstration in Malaria Control

Missouri

P. W. Covington	County health work

North Carolina

H. A. Taylor	Malaria surveys
W. H. Dumont [1]	Malaria surveys

Oregon

P. W. Covington	Organization of county health departments
A. J. Warren	Organization of county health departments

[1] Special Staff Member.

Tennessee

A. H. Fletcher[1] — Co-operative Demonstration in Malaria Control

Texas

A. P. Harrison — Organization of county health departments

E. W. Steel[1] — Co-operative Demonstration in Malaria Control

YELLOW FEVER ADVISORY COUNCIL[2]

Henry R. Carter, M.D., Assistant Surgeon General, United States Public Health Service

Juan Guiteras, M.D., Formerly Secretary of the Department of Health and Charities, Republic of Cuba

Hideyo Noguchi, M.D., Rockefeller Institute for Medical Research

Joseph H. White, M.D.,[1] Assistant Surgeon General, United States Public Health Service

AT HOME OFFICE

C. W. Wells — In charge of fellowships

J. L. Hydrick — Assistant to Director for the United States

W. P. Jacocks — Assistant to Director for the United States

ENGAGED IN SPECIAL HOOKWORM RESEARCH

S. T. Darling[1]
G. C. Payne

ON STUDY LEAVE

P. W. Covington
G. C. Payne
Louis Schapiro
F. L. Soper

ON SICK LEAVE

(for whole or part of year)

W. T. Burres
F. C. Caldwell
G. C. Payne

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[1] Special Staff Member.
[2] Not Staff Members; appointed to serve in an advisory capacity.

TABLE OF CONTENTS

I

The History and Objects of the International Health Board

More than thirteen years have gone by since the creation of an organization known as the Rockefeller Sanitary Commission for the Eradication of Hookworm Disease. Plans to this end, long maturing in the mind of Mr. John D. Rockefeller, took form in a letter of October 26, 1909, addressed to a group of men[1] who responded by accepting membership in the proposed Commission. Its object may perhaps best be described by extracts from the letter itself:

October 26, 1909

Gentlemen:

For many months my representatives have been inquiring into the nature and prevalence of "Hookworm Disease," and considering plans for mitigating its evils. I have delayed acting in this matter only until the facts as to the extent of the disease could be verified and the effectiveness of its cure and prevention demonstrated. . . .

Knowing your interest in all that pertains to the well-being of your fellow-men, and your acquaintance with the subject, I have invited you to a conference in the hope that it may lead to the adoption of well-considered plans for a

[1] Dr. William H. Welch, Dr. Simon Flexner, Dr. Charles W. Stiles, Dr. Edwin A. Alderman, Dr. David F. Houston, Mr. Walter H. Page, Dr. H. B. Frissell, Mr. John D. Rockefeller, Jr., Mr. Frederick T. Gates, Mr. Starr J. Murphy, Dr. P. P. Claxton, Mr. J. Y. Joyner.

co-operative movement of the medical profession, public health officials, boards of trade, churches, schools, the press, and other agencies, for the cure and prevention of this disease. If you deem it wise to undertake this commission, I shall be glad to be permitted to work with you to that end and you may call upon me from time to time for such sums as may be needed during the next five years for carrying on an aggressive campaign, up to a total of one million dollars ($1,000,000). . . .

Very truly,
(Signed) John D. Rockefeller

The Commission so created determined to attack the problem along three main lines:

1. To make a survey showing the geographical distribution and intensity of hookworm disease in the United States;
2. To cure the sufferers;
3. To remove the source of infection by stopping soil pollution.

More than a million persons in the United States were microscopically examined for the disease during the five-year experimental period of the Commission's life, and of these 441,408 were treated. Six hundred and fifty-three counties were surveyed, and more than 250,000 houses were inspected. The interest of physicians was enlisted by bulletins, letters, lectures, demonstrations, and personal interviews. The foundations of education were laid among the people by demonstration and the printed page. The press gave open-minded support to the campaign.

Fig. 3.—Administration Building, School of Public Health, Harvard University

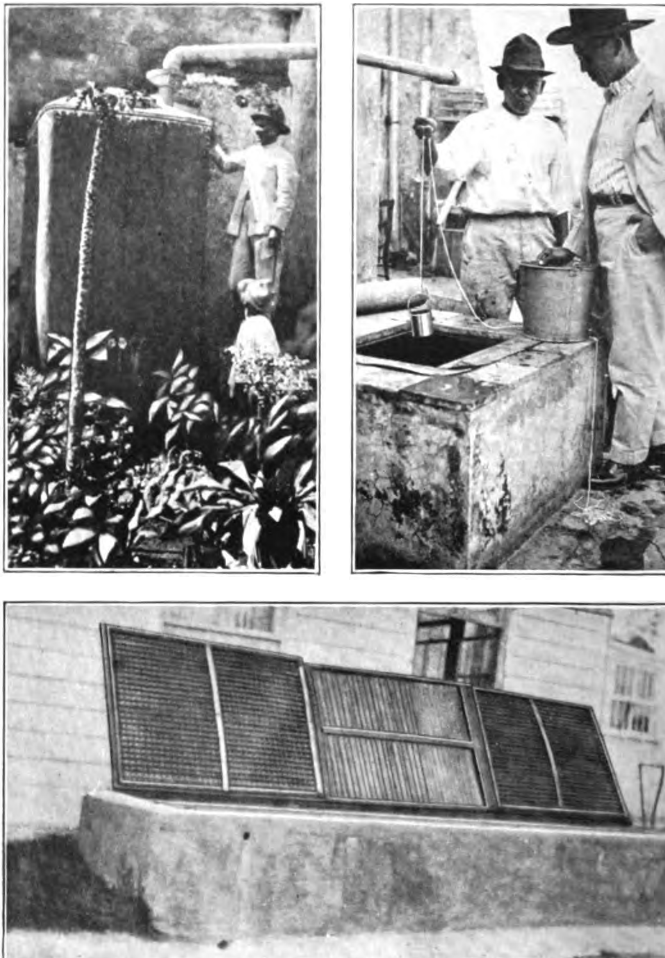


Fig. 4.—Controlling yellow fever by antimosquito measures. *Upper left:* officer and assistant inspecting rain water container to see that it is free from mosquito larvae; *Upper right:* inspector and fisherman depositing small native fish in a cistern to consume the mosquito larvae; *Bottom:* a tank at the headquarters office in Salvador for storing fish before distribution

In 1910 two counties appropriated $241 for the support of dispensaries; three years later this number had increased to 208 with budgets amounting to $43,649. During the whole period of operation, 1910–1914, appropriations totaling $110,000 were made by 556 counties.

In a letter of August 12, 1914, announcing the approaching termination of the five-year period, Mr. Rockefeller wrote: "The work thus far accomplished would seem to have brought about in all of the Southern States a very general knowledge on the part of physicians, health authorities, and the public, regarding the prevalence of hookworm disease and the method of treating and preventing it. The chief purpose of the Commission may thus be deemed to have been accomplished."

But Mr. Rockefeller's interest in public health did not cease. On May 14, 1913, the Rockefeller Foundation, a permanent institution, endowed by its founder with one hundred million dollars, received its charter by legislative enactment of the State of New York; and on June 27, of the same year, the Foundation created the International Health Commission[1] "to extend to other countries and peoples the work of eradicating hookworm disease as opportunity offers,

[1] The name of the International Health Commission was changed to International Health Board in 1916.

8

and so far as possible to follow up the treatment and cure of this disease with the establishment of agencies for the promotion of public sanitation and the spread of the knowledge of scientific medicine."

Principles and Practice

In the course of almost ten years of co-operative service with government authorities, hookworm infection the world over has been measurably diminished; progress has been made toward reducing the ravages of malaria; and a relentless campaign is still being waged against yellow fever wherever its danger flag appears. From the outset, however, the Board has maintained the conviction that public health is essentially a function of government. No private and temporary agency, whatever its resources, could or should discharge responsibilities which, by their nature, belong to the constituted authorities of the commonwealth. Private enterprise, therefore, may be best employed in awakening public opinion and thereby encouraging state and county officials to establish permanent agencies for public health work. Responsibility for the control and cure of any one disease has never been assumed by the Board; but aid has been given in control and cure where such steps might be expected to demonstrate a need and suggest a possible program.

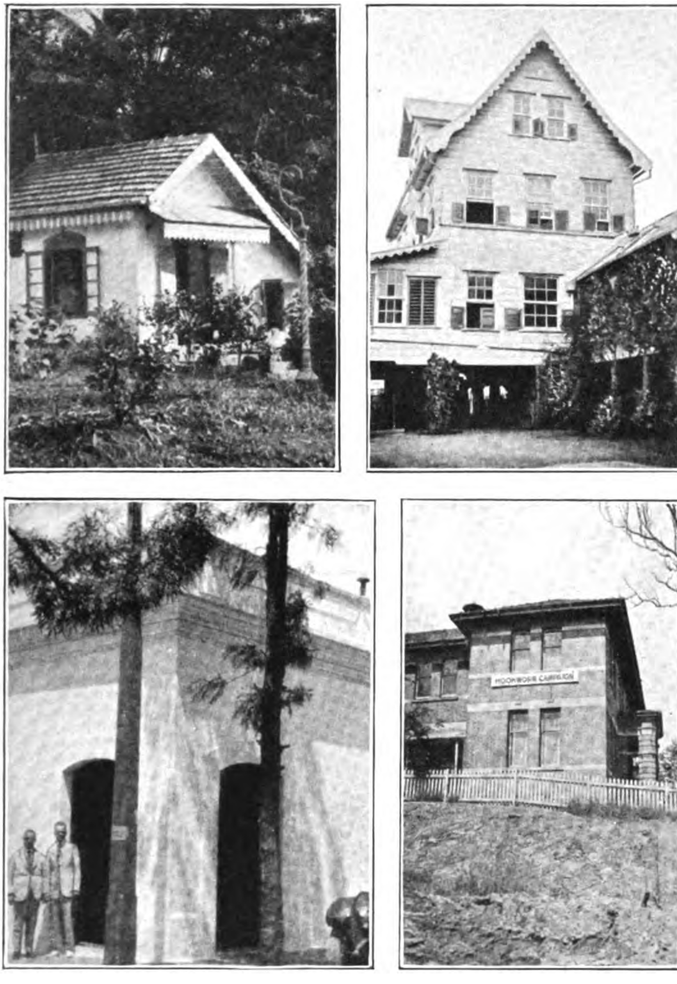


Fig. 5.—A group of hookworm offices in various countries in which the International Health Board is co-operating with the government in conducting hookworm campaigns. *Upper left:* the office at Kandy, Ceylon; *Upper right:* main offices of the Ankylostomiasis Commission, Surinam, Dutch Guiana; *Lower left:* national department of health building, Honduras; *Lower right:* office at Brisbane, Australia

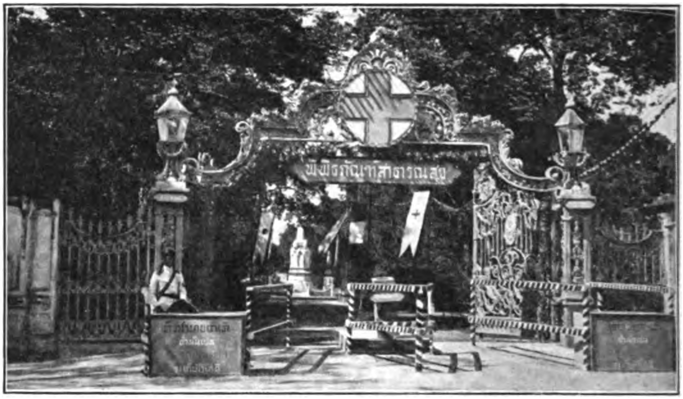


Fig. 6.—Entrance to the public health exhibition in the Royal Gardens, Bangkok, Siam, held, November 25 to December 9, 1922, under the auspices of the Siamese Red Cross Society, attended by more than 220,000 persons

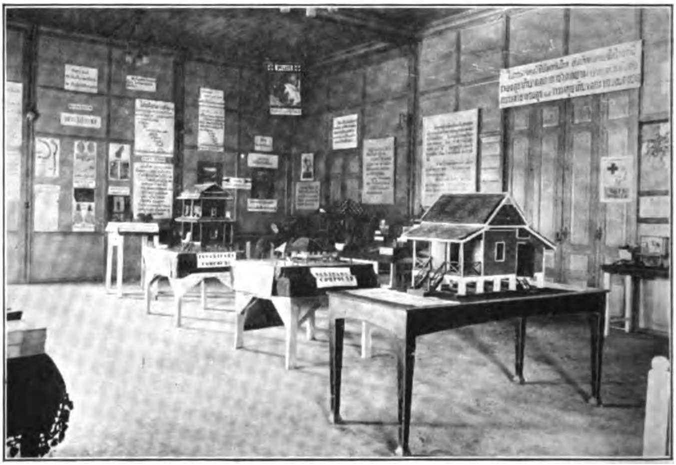


Fig. 7.—A section of the public health exhibition, Bangkok, Siam, illustrating the cause and methods of prevention of hookworm disease

Lastly, it has been clearly recognized that continued advance in preventive medicine the world over depends upon an adequate supply of skilled public health servants. Research has been aided in special cases where it might lead to the more effective application of existing knowledge to the control of disease. Training schools for health officers, nurses, and visitors have been promoted; contributions have been made toward the establishment of schools of public hygiene. And, finally, the fruits of these enterprises have been made accessible to a broader circle by means of international fellowships.

The demonstration and cure of disease arouses a public sentiment which expresses itself in legislative appropriations for specific and general health purposes. Progress on the administrative side, in turn, creates a demand for technically trained men and women to carry out new programs. Thus public enlightenment, government machinery, and technical education and research are bound up in a sure sequence which may be traced in some of the activities of the Board during 1922.

II

The Campaign against Yellow Fever

The attention of the Board was first vividly directed toward the menace of yellow fever as a

result of a trip which the General Director took to the Far East in 1914. On every hand he found concern lest the opening of the Panama Canal might involve the introduction of the disease into the East by ships routed through a then-infected area. General Gorgas was consulted; and the following extract from a memorandum of a conversation on July 14, 1914, gives a glimpse of the imaginative power with which General Gorgas approached a problem of difficulty and magnitude. "'The Commission,' he said, 'could not undertake a better piece of work than this. Here is a disease that has commanded an unusual amount of attention; one in which all tropical and semitropical countries are now keenly interested. Its eradication would command the attention and the gratitude of the world. And the thing can be done! . . .' He left with the understanding that the discussion of the subject would be continued with a view to maturing a plan of organization and of work for the accomplishment of this end."

The Outlawry of Disease

Twenty-five years ago yellow fever menaced the Western Hemisphere from Santos, Brazil, to Washington, D. C., and Cairo, Illinois; on the west coast it ranged from southern Peru to northern Mexico. Gorgas exterminated the in-

fection from Cuba and Panama; Oswaldo Cruz and his colleagues brought it under control in Santos and Rio; Wolferstan Thomas, Converse, and the Brazilian authorities drove it out of the Amazon Valley; Connor freed Guayaquil. During the past year Hanson has completed the conquest of the infection in Peru, while Lyster, White, and their colleagues, working with government authorities, have seemingly exterminated the disease in Central America and have the situation well in hand in Mexico. At the end of 1922, the only infected areas remaining in the Western Hemisphere appeared to be eastern Mexico and a narrow coastal zone in eastern Brazil from Ceará to Bahia. No other infectious disease has been so completely subjected to human control as has yellow fever, since the day when the Stegomyia was found to be its intermediary host.

Epidemic Conquered in Peru

The epidemic which overran the province of Piura from March to August, 1920, and broke southward through the control barrier into the provinces of Lambayeque and Libertad, brought between 15,000 and 20,000 cases of fever in its train. It was conquered in Piura by August, 1920; in the southern districts by August, 1921. Nevertheless, Dr. Henry Hanson remained at

the Government's request until the end of July, 1922, in order to complete a campaign of control and investigation which, all told, covered 700 miles of coastline and included approximately 1,000,000 house visits. With Stegomyia index reduced to a safe figure, and with a small supervisory staff left to guard against recurrence of the disease, Dr. Hanson returned to the United States in July, 1922.

A Summons from British Honduras

Records for sixteen years from 1905 showed no case of yellow fever in British Honduras. In August, 1921, however, three cases appeared almost simultaneously in St. John's College, a Catholic institution just outside the capital city of Belize. The Governor's notification to the International Health Board was immediately answered by the dispatch of fresh vaccine and serum; and within a few days Dr. Vaughn was moving from Túxpan, Mexico, to the center of infection. The outbreak was definitely checked in mid-November after twenty cases in all had appeared.

Control of inspection during 1922 alternated between Dr. Vaughn and resident medical authorities until September 1, when the participation of the Board came to an end. On this date the Stegomyia index has been reduced to a low

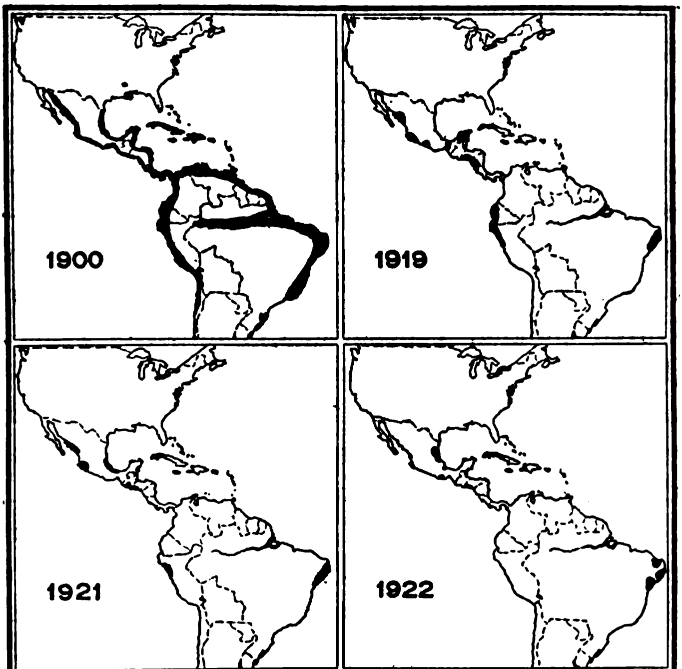


Fig. 8.—Yellow fever in retreat. Map of western hemisphere showing steady reduction of infected areas

figure; but special measures of vigilant inspection will be required.

Maintaining the Ground Already Won

In spite of the fact that the rest of Central America is apparently rid of yellow fever, there has been no lapse in supervision. In Guatemala, control of Stegomyia breeding is strict and successful. In Salvador a marked decrease in the percentage of breeding has taken place as against

the figures for 1921. In Nicaragua the problem is merely one of unceasing vigilance. Yellow fever commissions of the several governments experienced in the technique of control are continuing an intergovernmental co-operation which was previously found to be the only effective way of combating the active disease. No case was reported during 1922 from British or Dutch Guiana, Venezuela, Colombia, or Ecuador; neither has any case of yellow fever been recorded in the Caribbean littoral for the last three years.[1] Presumably that region, together with the Amazon Valley, is now free from infection. In the interest of certainty, however, competent persons will be sent by the Board during 1923 to make a thorough inspection of the entire region.

Further Reduction of the Frontier

The campaign in Mexico has been vigorously pressed during the past year. It is now practically certain that a virulent outbreak occurred in 1921 among the troops in barracks at Huejutla, state of Hidalgo, originating among troops at Chapapote Nuñez, just west of Túxpan. After smoldering twelve to twenty months in this almost inaccessible country, the epidemic passed through El Hijo, Tempoal, and Tantoyuca down

[1] In March, 1923, an epidemic appeared in Bucaramanga, Colombia, which later proved to be yellow fever. Control measures were promptly instituted. Up to July 1 there was no evidence of infection in ports on the Caribbean littoral.

the river to Pánuco, which showed cases in July, 1922. Altogether fifteen cases appeared among the population, four fifths of whom were transient residents from the highlands, and therefore highly susceptible. The outbreak in Pánuco was arrested, and by late autumn it had ceased to be a factor in the situation. Tampico, Ciudad Victoria, and Túxpan, however, did not escape, and from August to December disclosed twenty cases, of which twelve were fatal. Yet by the middle of December, 1922, Tampico was absolutely clean, with a Stegomyia index of less than 5 per cent; the incidence of Ciudad Victoria had been brought low enough to eliminate risk of spread; and the chance of infection from Túxpan was remote indeed. The results of the campaign may be largely ascribed to the splendid efforts of

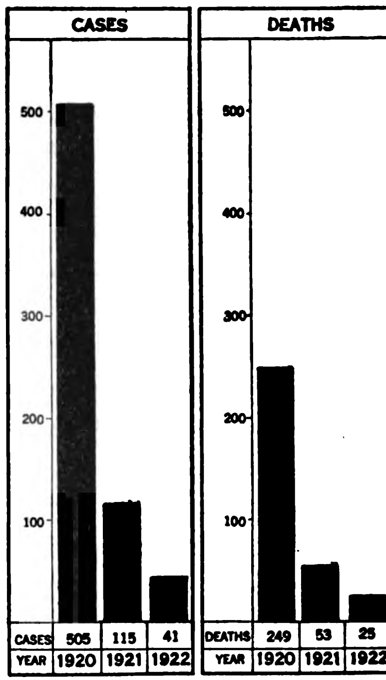


Fig. 9.—Yellow fever cases and deaths in Mexico, 1920–1922

the Mexican Government and Mexican people.

Aside from these infected spots, where every effort will be made to maintain an index of 5 per cent or better against a fresh appearance of the fever, Gutiérrez Zamora and Papantla are being reduced, and the Vera Cruz, Merida, Colima, and Mazatlán areas are well in hand. In Yucatan, under Connor's direction, the Stegomyia index was cut down from 50 per cent to 8.5 per cent and subsequently was still further reduced. On the whole, indications are favorable. Official figures of cases in all Mexico have fallen from 505 in 1920, and 115 in 1921, to forty-one during 1922. Continued supervision under the co-operative effort of the Mexican Government and the International Health Board during the coming year may be reasonably expected still further to reduce these figures.

The federal health service of Brazil has been engaged for the past three or four years in an effort to complete the work of yellow fever control. A considerable outbreak occurred in the state of Ceará during 1922. Fortaleza, its capital, seemed to be the focal point, and in that city several deaths occurred, including two Americans. In spite of all difficulties, the Government is eager to keep the work of control in hand, fully aware that unless effective measures are established and maintained, the continuance of the

disease will be a menace not only to neighboring countries of the southern continent, but also to the lives of Brazilians and the material well-being of their country.

The Situation Changes in West Africa

Following a preliminary survey of a commission of the International Health Board in 1920, it was decided in May, 1921, to send a second commission, adequately equipped and trained, with the special object of proving the existence or non-existence of yellow fever. Before it could be assembled and necessary governmental arrangements could be concluded, the first point of its inquiry seems to have been determined by the outbreak of an epidemic in Grand Bassam, Ivory Coast, in August, 1922. Twenty cases, with three deaths, were reported, together with one death in Togoland; and there have been rumors of sporadic cases in Dahomey, Gold Coast, Gambia, and French Sudan. These fresh developments, if verified, will doubtless have a bearing upon the character and objects of the commission.

III

Malaria at Home and Abroad

The joint arrangement whereby state departments of health, the United States Public Health

Service, local communities, and the International Health Board have shared in carrying out demonstrations in malaria control was continued through 1922 and will be followed in 1923. New demonstrations were undertaken during 1922 in 32 towns in 8 states, and on a county-wide scale in 34 counties in 5 states. Realizing that success depends to a great degree on enlightened public opinion, an intensive effort has been made to spread knowledge of the fact that malaria can be controlled with immense benefit to the community and the individual at small per capita cost—in some areas as low as 45 cents.

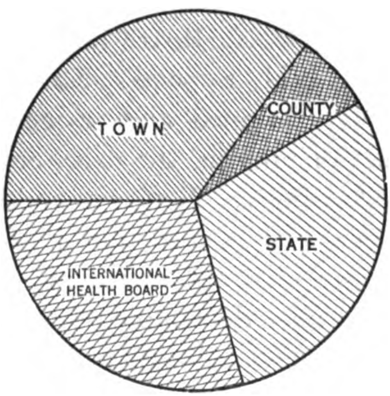


Fig. 10.—Sources of specific appropriations, amounting to $166,048, for county and town malaria demonstrations in 1922, not including cost of general supervision or malaria control work by forty-four county health departments

The fruits of this joint work are more and more apparent. Eight states now employ full-time supervisors assisted by technically trained personnel. Surveys or demonstrations were begun in 1922 in California, Missouri, and Illinois, and requests for surveys were received from Florida and Oklahoma. For the last two years,

those engaged in control measures in the Southern States have been brought together at the time of the Southern Medical Association meetings, in order that there might be an interchange of experience. This has been a valuable conference, and it will doubtless be repeated in 1923. In these indirect and direct ways, the Board plans to aid states in the maintenance and extension of work already accomplished.

Experiments in the Field

The joint investigation at Mound, Louisiana, by the Bureau of Entomology of the Department of Agriculture, and the International Health Board, in the abundance, distribution, and natural infection of Anopheles mosquitoes, was continued during 1922. During 1923 further light will be sought on the possibility of eliminating breeding conditions in the bayous by impounding of the water followed by fish control; on the effect of screening in the reduction of malaria; and on the effect of location of houses with respect to mosquito prevalence. Further tests will be made to determine the preference, if any, of the female Anopheles for certain hosts, especially to ascertain the percentage feeding on domestic animals and on man, respectively, where both are equally accessible. Dr. Taylor, in Pamlico County, North Carolina, found that

administration of quinine in a selected area where local conditions made other measures impracticable, brought about a reduction of malaria of 80.0 per cent among the white population, and 66.5 per cent among the colored.

Malaria Survey in Italy

In response to official invitations, the General Director visited Italy early in April, 1922; conferred with government authorities, the Italian Red Cross, and a number of individual scientists and organizations interested in malaria control and took advantage of opportunities to visit certain field work stations. Malaria is the outstanding health problem of the country. With approximately two million cases a year, the disease is not only a vital factor in the life and health of Italy, but a matter of serious concern on the economic side as well. The situation of the country well within the Anopheles belt, the presence of marshes, canals, and sluggish streams choked by vegetation, the migratory character of agricultural labor, a singularly virulent and hardy type of mosquito (*Anopheles maculipennis*), and unfavorable housing conditions,—all conspire to create a problem of the first magnitude.

Government agencies, assisted by various voluntary organizations, have been fighting malaria, but so far have confined their efforts to

the distribution and administration of prophylactic quinine on a generous scale. An apparent decrease has taken place in the malaria morbidity rate, but scientists and public health authorities have been anxious to secure the co-operation of the International Health Board in a series of field experiments to test the efficacy of present methods of control and the possibility of adapting other tried methods to Italian conditions. In conformity with this request, a representative will be sent to Italy during 1923 to make a survey.

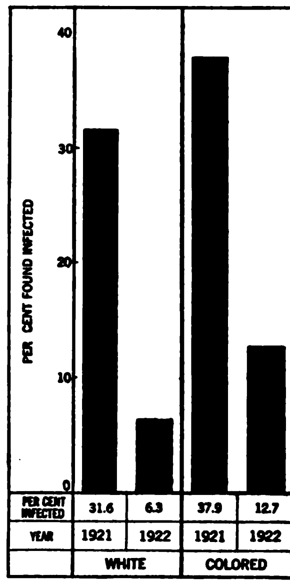


Fig. 11.—Reduction of malaria cases in a selected area in Pamlico County, North Carolina, effected by means of the standard quinine treatment. Figures are based on blood examinations

The Board is also co-operating with the Government of Palestine in investigating the various malaria problems of that country. The several variations in altitude and the prevalence of cistern breeding of Anopheles, are two phases of malaria which can be advantageously examined in that area. In 1922, the Board participated in an extensive malaria

survey of the towns of Beisan, Tantura, and Sanour. At the same time an irrigation survey and plan for reclaiming the Beisan and Sanour swamps was made. The Beisan swamps, created in 636 A. D. when the Emperor Heraclius cut canals in order to flood the fields against the besieging Mohammedans, have existed ever since that date. No record exists of any attempt to drain them until the British arrived after the War. The first problem, therefore, lies in the field of engineering, and its solution rests upon the decision of Government.

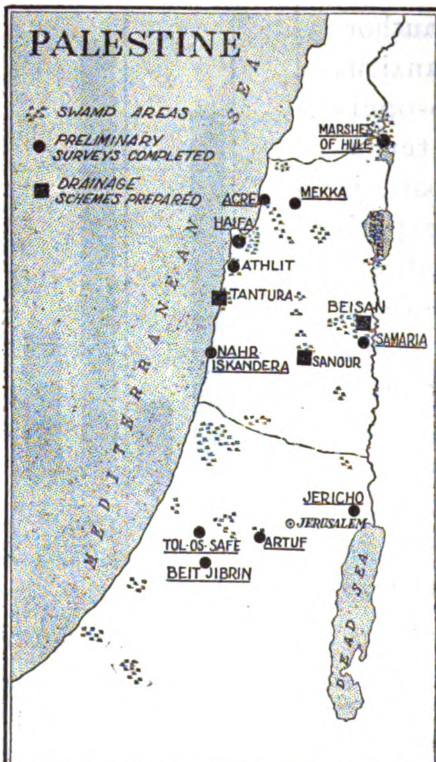


Fig. 12.—Map of Palestine showing location of areas in which malaria surveys and drainage plans were made in 1922

In Brazil field studies of four selected areas were inaugurated. Preliminary surveys showed a high rate of infection and indicated that malaria shows no preference for a particular age, race, or sex. Control measures will be instituted during 1923. Malaria control, begun in Aguirre, Porto Rico, in 1921, was continued in co-operation with the Insular Department of Health and the Central Aguirre Sugar Company. Production of larvae was curtailed by various means such as drainage, oiling, and fish distribution.

Intensive measures of control in the tropical La Puebla-Rivas district in Nicaragua, begun in 1921 and continued through 1922, resulted in an almost complete elimination of Anopheles from the experimental area. This test showed that simple, inexpensive measures already employed in the Southern States can be successfully followed in tropical areas. A survey is under way in the Philippines to determine the feasibility of applying antimosquito measures to a small area.

IV

French Authorities Carry on Against Tuberculosis

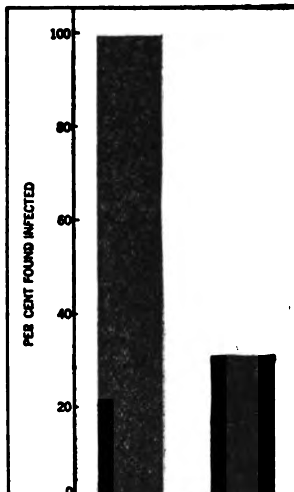
For more than five years since September, 1917, the Board has worked with the French Government and existing agencies in a compre-

hensive campaign against tuberculosis. War had increased the tuberculosis mortality, and had prevented the increase of facilities to attack it. Indeed, there were but twenty-two tuberculosis dispensaries in the country, with provision for not more than 8,000 beds. During these five years of common service a careful survey of the situation has been made. At the end of 1922, there were 421 dispensaries at work, of which 301 were created on the initiative or with the co-operation of the Board. Six schools for visiting nurses are in operation on an apparently permanent basis. An educational campaign making use of mobile exhibits, pamphlets, plans, and newspaper publicity has been conducted on a country-wide scale.

In 1922 the Board continued operations in a number of departments which had been granted subventions but not entirely organized in earlier years; made supervisory inspections in forty-five departments to improve the administrative and technical phases of the work; made an examination of existing dispensaries; provided fifty-five scholarships for postgraduate study; and maintained fruitful relations with the Ministry of Hygiene and the Comité National de Défense contre la Tuberculose.

It was agreed from the outset that the work should eventually be assumed by the French authorities; and their response has been whole-

hearted. In the face of known difficulties which would seem to make the acceptance of further obligations impossible, the Conseils Généraux of the various departments have increased their previous appropriations, and the National Assembly has voted an additional three million francs to be spent for dispensaries and laboratories. The entire continuation campaign is now in French hands, with the single exception of the division of public health visiting, where every attempt is being made to improve the teaching facilities of the existing schools. Encouraging progress has been made, and the October, 1922, session of the School of the Comité National in Paris opened with a record registration of 108 pupils. Steps have been taken to insure the employment of only trained workers as public health visitors; a scheme for a national pension fund is under consideration by the authorities; and the time is well within sight when the remaining measure



YEAR	1914	1921
PERSONS EXAMINED	1,433	498
PER CENT INFECTED	99.4	31.3

Fig. 13.—Reduction in rate of hookworm infection among school children in Grady County, Georgia, from the date of the original survey in 1914 to the resurvey in 1921

of the Board's responsibility for a program begun in 1917 will be turned over to the permanent control of Government.

V

Hookworm Control and Public Health

The relation between the reduction of hookworm disease and the spread of knowledge of public health is very direct; for the relief and control of this disease is a striking object lesson in the control of disease in general. In its nature, causes, and cure, it is easily understood by the common man, and its effects upon his own health and the health of the community are plainly demonstrable. When he has seen this one disease treated and dramatically brought under control, he is prepared to give heed and support to the control of diseases that are less simple and less tangible.

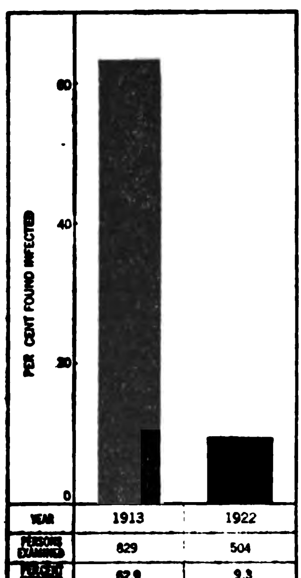


Fig. 14.—Reduction in rate of hookworm infection among school children in Pamlico County, North Carolina, from the date of the original survey in 1913 to the resurvey in 1922

The Rockefeller Sanitary Commission undertook its first specific task in hookworm control in Richmond County, Virginia, in 1910. Funds were supplied by the Commission, but the direction was by the Virginia State Board of Health. From the outset the Commission realized that co-operation of state and national health departments was not only a formal condition precedent to effective work, but a factor of indispensable value in itself. For the menace of hookworm, which threatens more than half the world—900,000,000 people live in areas of infection—can only be dispelled by spreading knowledge of the disastrous consequences of the disease and of the elementary practices of hygienic living.

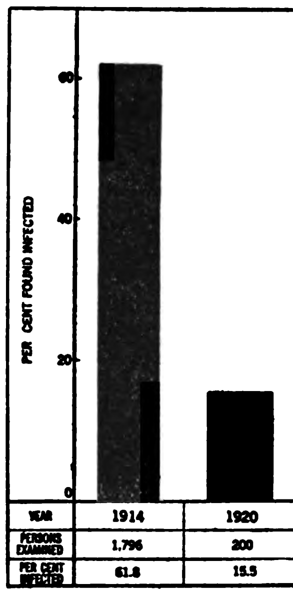


Fig. 15.—Reduction in rate of hookworm infection among school children in Lee County, Alabama, from the date of the original survey in 1914 to the resurvey in 1920

The Final Stage in the United States

In May, 1921, in conformity with its policy, the International Health Board transferred its

part in the hookworm campaign in the United States to government authorities. The work it supports is now being administered largely as part of county health programs. During the last three years resurveys of ground covered between 1910 and 1914 were aided by the Board in sixty-six counties. An average reduction

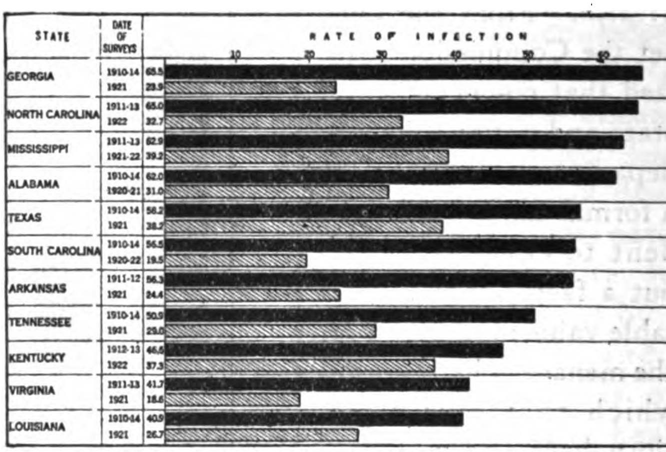


Fig. 16.—Average rates of infection among school children in Southern States at time of original hookworm surveys, compared with the present rates as shown by resurveys conducted in 1920, 1921, and 1922

in infection of 47.5 per cent was indicated. Typical results in selected counties are shown in Figs. 13, 14, and 15. Additional resurveys will be made from time to time in order to ascertain whether progress is being maintained, and in these the Board plans to co-operate. Common service over a period of years has strengthened ties between the Board and government

organizations so that withdrawal from one particular field merely releases the energies of the Board to assist state and local authorities in other public health enterprises not so thoroughly established.

Brazilian Authorities Assuming Control

Equally gratifying has been the manner in which federal and state authorities in Brazil have responded to evidence of the public health needs of the nation. In 1916, when the International Health Board's work began, there were neither federal nor state appropria-

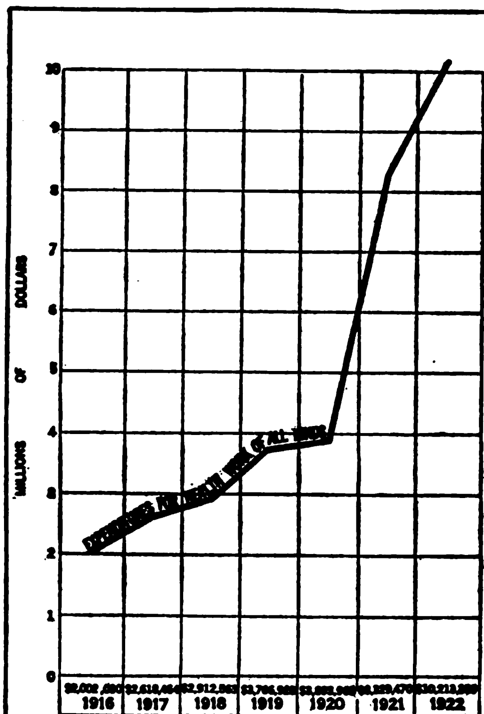


Fig. 17.—Increase in expenditures, 1916–1922, for health work of all kinds in fourteen of the twenty states of Brazil for which information is available

tions for rural sanitation. In 1917, something over $12,000 was contributed for this purpose; and by 1922 the available yearly appropriations had increased to more than $2,000,000. This striking response to an obvious need has allowed the Board to extend its own activities to other fields: to demonstrations in malaria control; to assisting the growth of county health organizations; and to aiding in the creation of a public health nursing service. So far as the control of hookworm disease is concerned, practically the entire populated area of Brazil has been drawn into a program of rural sanitation assisted by federal authorities.

Special circumstances make it advisable for the Board to continue its support to the São Paulo Instituto de Hygiene for a period of two years more until its value to state authorities can be thoroughly demonstrated. Meanwhile, the Instituto is co-operating with the state sanitary service in research and in the training of personnel.

Agreements with Colombia and Paraguay

An arrangement made in 1920 with the Government of Colombia, whereby the Board agreed to lend financial assistance in rural sanitation for five years on a diminishing scale, has been marked in the main by success. The financial depression has resulted in a temporary reduction

of Government's program. On the other hand, both people and Government have entered energetically into the spirit of the enterprise. A capable sanitary staff has been created, and actual sanitation has been kept well in advance of field clinics. Progress in this sphere has stimulated discussion of a general public health scheme, and the need of a public health laboratory and training center is clearly realized.

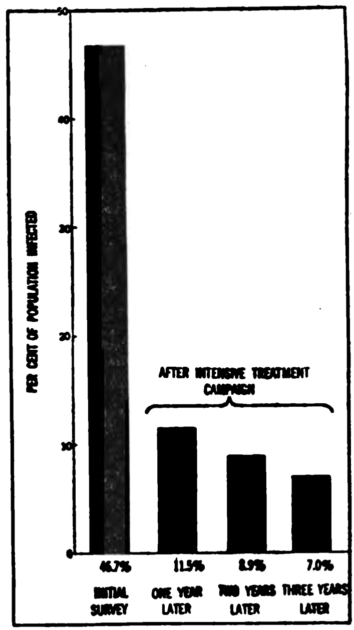


Fig. 18.—Reduction in hookworm infection rates on four estates in the Vere area, Jamaica, resulting from treatment campaigns

These developments in Colombia have encouraged the Board to enter into a similar five-year program with the Government of Paraguay in a program of rural health advancement which will include control of hookworm disease.

Progress in the West Indies

In **Jamaica**, in the face of serious obstacles, the work has been measurably successful. Government effort has increased hand in hand with

a more vigorous public opinion. There has been a marked reduction in typhoid fever and dysentery wherever latrines have been introduced. The opinion is therefore beginning to prevail in government circles that hookworm control should be included as part of a comprehensive public health program. A qualified full-time sanitarian has been put in charge, provided with authority and equipped with the necessary funds.

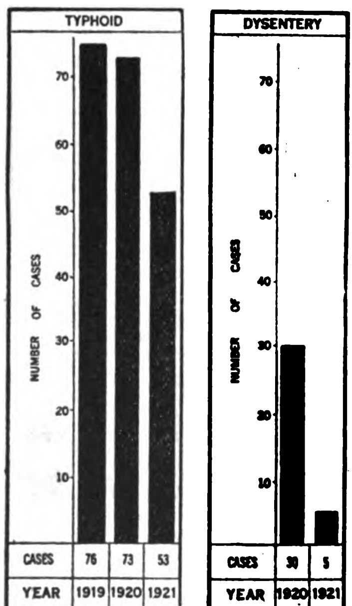


Fig. 19.—Reduction in number of admissions to the Spanish Town hospital, St. Catherine Parish, Jamaica, for typhoid and dysentery, following a sanitary campaign conducted in the town during the latter part of 1920

Operations begun in 1921 in Porto Rico have resulted in more than one thousand cures of uncinariasis a month during the year 1922. Sanitation measures throughout the island are well ahead of the curative program. The representative of the International Health Board has been made director of the government division of anemia work; but he will eventually

be succeeded by a medical officer more directly representative of the Government. In response to a request of the authorities, the extent of the Board's co-operation will be increased.

Uncinariasis work in **Dutch Guiana** during 1922 aroused marked interest among the East Indian population. The Board's film, "Unhooking the Hookworm," which has been shown widely, has had much to do with awakening the interest of the free Javanese. An influential member of a Javanese settlement was temporarily employed on the staff of the Board to work among his own people, many of whom voluntarily constructed latrines.

In **Trinidad** and **St. Lucia**, the Board is still engaged in aggressive programs. The respective governments and people have been so active that definite terminations can now be set for the co-operative activities of the Board in these areas. In view of this prospect, the Board is now able to accept the invitations of the governments of Dominica and St. Kitts and Nevis to conduct infection surveys on these islands.

Owing to war conditions, work was closed in **Antigua** in 1917. No hookworm control measures have been in force since that time, and no sanitary measures have been carried on by the Government since 1920. However regrettable these circumstances may be in themselves, they

afforded material for an interesting resurvey during 1922 by the Board's representatives. Three of the typical heavily infected districts examined showed a reduction in the infection rate from 29.8 to 20.2, or 32 per cent, together with an increase from zero to 7.1 per cent of homes with latrine accommodation. The exact educational value of the earlier campaign is hard to estimate, but it is interesting to note that of the latrines found more than one third had been constructed on private initiative.

Increased Government Effort in Central America

The growth of the movement in Honduras for a public health campaign, especially against uncinariasis, must be largely ascribed to the efforts of Dr. Brizio, who has worked untiringly toward this end during the past ten years. In April, 1922, he was made director-general of the Department of Public Health, with almost unlimited authority. A corps of sanitary police has been formed to enforce excellent existing sanitary laws which have long been a dead letter, and the Government intends to establish a national public health laboratory during the coming year. A general survey of three typical regions was concluded in June, 1922. The rate of infection was found to be unusually high, and in certain areas the presence of the round-

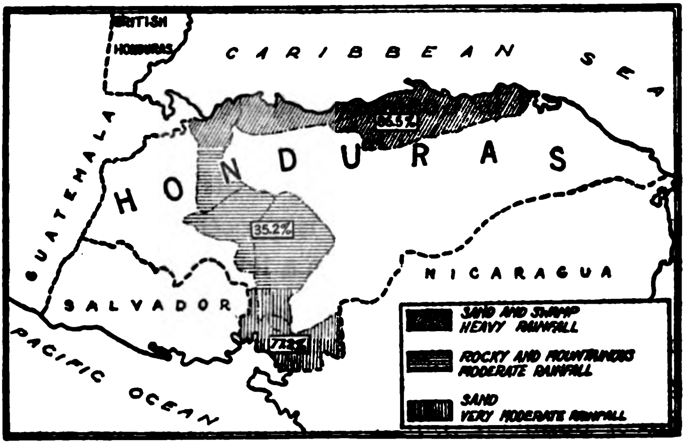


Fig. 20.—Hookworm infection rates in Honduras as disclosed by preliminary surveys in three typical regions, made in June, 1922

worm (*Ascaris lumbricoides*) in a high percentage has complicated the problem. A department of uncinariasis, with the co-operation of the International Health Board, has begun its work. Numerous applications for treatment were at once received; more than five thousand persons presented themselves within the first thirty-one days. The medical profession, the church, and the press have joined hands with Government and with the Board in giving cordial support to the work.

In **Costa Rica, Nicaragua,** and **Salvador** the responsibility for hookworm control has been transferred to special government departments, and other lines of health work are being undertaken. Public health laboratories have been

established and are gradually widening the scope of their activities.

The work in **Guatemala** shows slow progress. A central laboratory has been created, and field stations have been operating in districts hitherto not reached. Education is proceeding step by step with treatment, and in a few localities it has shown encouraging results. The central government is keenly alive to the situation and has given some indirect aid to the program. Its direct financial contribution, however, has been slight.

In **Panama** progress is retarded by labor difficulties and a lack of energetic effort on the part of local authorities. Nevertheless presanitation, with the Government's support, is making advances and the hookworm program should show results during the coming year.

The Hookworm Campaign in the Far East

Surveys conducted in the **Philippines** during 1922 showed that infection had apparently increased during the past ten years, and fresh measures have been undertaken by the Government Health Service. The hookworm survey of **Australia** and its dependencies was completed in the latter part of the year and a permanent control plan was immediately inaugurated. Curative measures were applied within the twelve

months to more than 50,000 persons in **Fiji** where excellent results were obtained by mass treatment with carbon tetrachloride. Permanent agencies under government control have now assumed direction of the work which had been instituted in northern **Siam**. A comprehensive survey of the whole kingdom is under way.

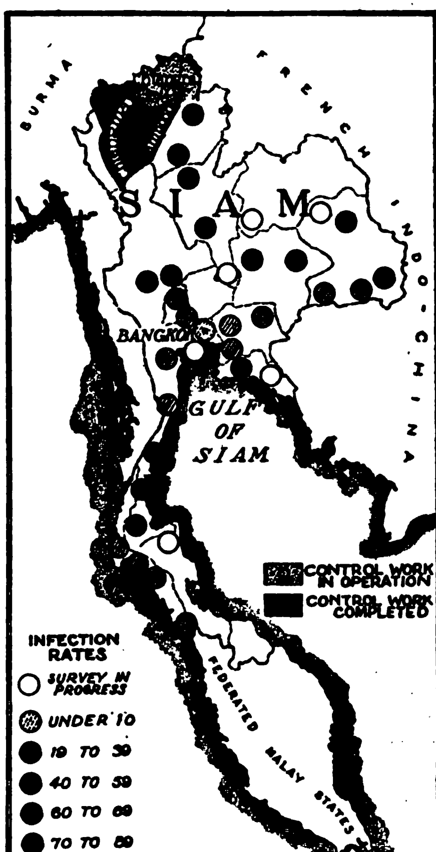


Fig. 21.—Map of Siam showing progress of hookworm survey and control campaigns at the close of 1922

The Board is co-operating in the first stages of operations in **Mauritius** and is assisting in a thoroughgoing program of education and treatment in **Ceylon** where striking progress has been

made with demonstrations in hospitals and public dispensaries. As these institutions will become permanent centers of curative work, they should play an important part in reducing the mass infection of the island. The Board concluded its co-operative activities in **British North Borneo**, leaving government authorities with the situation well in hand.

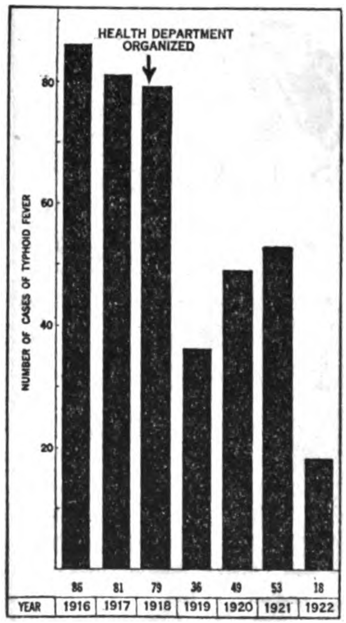


Fig. 22.—Reduction of number of typhoid cases in Harrison County, Mississippi, resulting from the work of the County Health Department established in 1918 following activities supported by the International Health Board

India's Gigantic Task

Out of forty million people living in Madras Presidency alone, it is estimated that more than thirty-six million are infected with hookworm disease. A widespread campaign of popular education is under way, and hospitals are incidentally giving treatment for the disease to all patients as a routine measure. A convincing experiment was under-

taken among 298 students of the Madras Medical College who were skeptical of the prevalence of the disease, but were willing to be examined. Two hundred and forty-one were found infected; and it is safe to assume that as many qualified doctors, with improved health, will advocate hookworm control in those districts in which they undertake private practice.

Improving the Technique of Hookworm Control

Field studies have produced valuable results during the year 1922. Dr. Smillie, assisted by Drs. Klotz and Pessoa, made studies to determine the ascaridol content of oil of chenopodium, and the efficiency of ascaridol as compared with oil of chenopodium in the treatment of hookworm disease. Other studies were made by Dr. Smillie of carbon tetrachloride as an anthelmintic used alone, or in combination with ascaridol. It was discovered that these drugs are complementary in their action and apparently can be used together without increasing the toxic effect of either one. This has led to the outline of a simple, practical, and efficient method of treatment. The use of carbon tetrachloride is so recent that its limitations are not yet well understood, but thoroughgoing pharmacological investigations are under way. Studies to determine the practical value of these drugs in

the treatment of hookworm disease have been carried on in the field by Drs. Washburn and Sisco in Jamaica, Dr. Hausheer in Dutch Guiana, Dr. Leach in Ceylon and in the Philippine Islands, Dr. Hampton in Ceylon and in Mauritius, and Dr. Lambert in Fiji. Colonel Clayton Lane has independently continued in London investigations begun in 1921 in Assam, with a view to improving his levitation method of fecal diagnosis.

The experiments of Caius and Mhaskar in India during 1921 showed that betanaphthol is a powerful vermifuge. Later experiments in India and elsewhere, however, have indicated that the drug has toxic qualities which are particularly dangerous in the field wherever malaria is prevalent.

At the Source of the Disease

Knowledge of the life history of the hookworm has been considerably extended since the discovery by Baermann in 1917 of a method for isolating the larvae from the soil. Dr. Cort, who in 1921 began a series of investigations in Trinidad, carried his experiments further in Porto Rico during 1922, with confirmation of the earlier results. He and his associates have been able to show that it is a common thing in nature for the larvae to complete their second

moult and lose the sheath in the soil, and that such larvae are infective then as well as when sheathed. Their studies also indicate that while swine are to be regarded as important disseminators of the parasite, the activities of chickens are on the whole more beneficial than harmful.

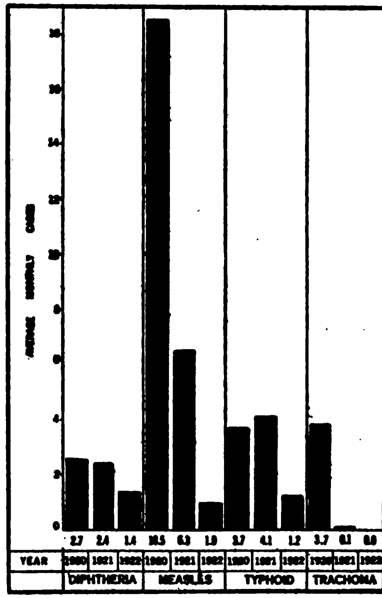


Fig. 23.—Average number of cases, by months, of certain communicable diseases in Harlan County, Kentucky, since the inauguration of the County Health Department in 1920

In one area it was found that mass treatment produced more than 90 per cent reduction in human infection, which in a period of six or seven weeks produced an equal reduction in soil infestation. The larvae, as Cort's studies have shown, do not live longer than six weeks under the conditions prevailing in summer in Trinidad, British West Indies. The finding that hookworm larvae can develop and migrate to the surface when buried three feet deep in sandy loam soil shows the

limitations of burial as a means of disposal. Experiments conducted by Dr. Hampton in Ceylon show that larvae buried to a depth of 12 inches will find their way to the surface of the soil in about five days. Similar experiments will be continued with the help of the Board during 1923, as calculated to throw valuable light on more effective methods of control. In general, the investigations of the past year have contributed greatly to the exactness of our knowledge of the problems of control and have indicated quite clearly the direction which the improvement of remedial measures should take. The problems have been simplified, but many details still remain for investigation, particularly as to the choice of methods for preventing soil pollution.

Proposed Survey in Spain

The General Director of the International Health Board and Dr. Linsly R. Williams visited Spain in February, 1922, in response to an invitation from the Spanish Government. The problem of the authorities is rendered more difficult because of the scarcity of potable water in towns and cities, and the lack of popular education in hygienic living. The typhoid death-rate is 33.6 per hundred thousand as against 3.5 in New York State, and the infant mortality rate 169 per thousand births as against 86 in

Fig. 24.—Some of the activities of a county health department. *Upper left:* inspecting school children for enlarged tonsils; *Upper right:* county health department nurse instructing a young mother in the care of her baby; *Bottom:* negro mothers with babies at a baby clinic. One of the principal activities of a county health unit is the well-baby clinic for the examination of infants and children of pre-school age and the instruction of mothers in child hygiene

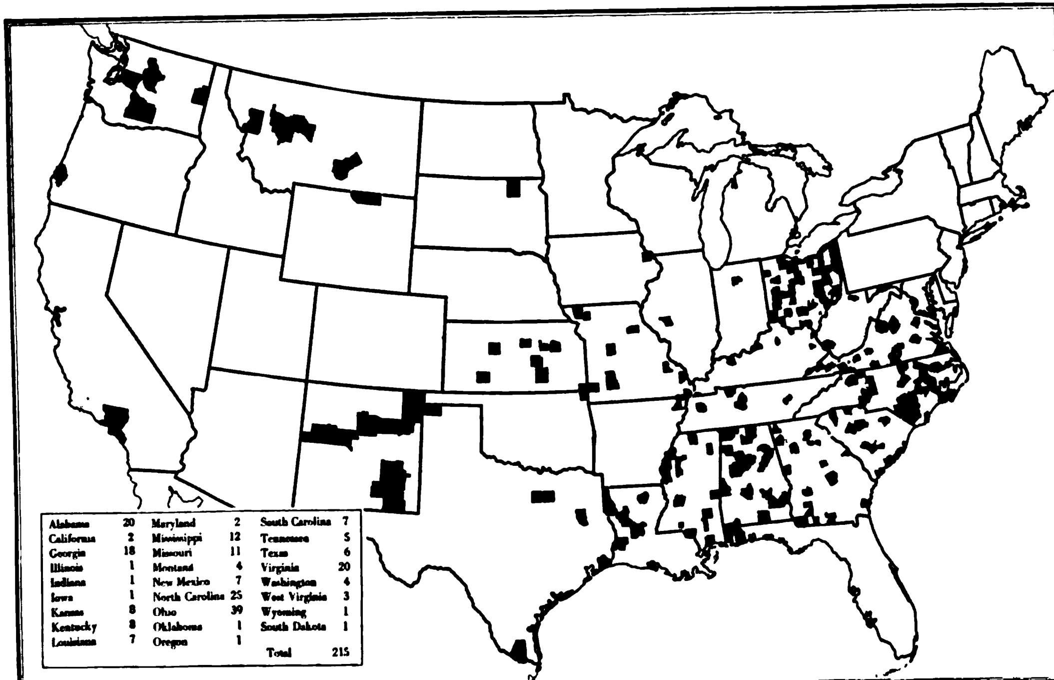


Fig. 25.—County health departments at the close of 1922

New York State. There also seems to be considerable hookworm infection in the mines. In the solution of this latter problem the International Health Board plans to co-operate with the Spanish Government to the extent of conducting a survey. Further action by the Board will naturally depend upon the disclosures of this first study. At every point of discussion the Spanish Government has shown itself anxious to create more favorable conditions in public health.

VI

Extension of County Health Work

The Encouragement of Public Health Agencies

The creation of county health units has proceeded steadily both in the United States and abroad. Practical demonstrations showed the county to be an effective unit of organization for providing adequate health protection for small towns and rural communities, and it was hoped that there might come into being county health services of a permanent character capable of dealing continuously with the problems of the several communities within their jurisdiction. To further the development of such units the Board has provided funds for initial demonstrations. Almost invariably such aid has resulted in the assumption of responsibility by authorities.

Difficulties of a transitional nature have been relieved by financial encouragement wherever necessary.

In the Southern States county health administration developed in connection with programs of hookworm control and rural sanitation, where the necessity for a full-time organization for the county was soon recognized. In the early days, the interest of the county units centered around hookworm dispensaries, the building of latrines, vaccination against typhoid fever, and measures bearing upon the control of filth-borne diseases. Later these services directed their energies to

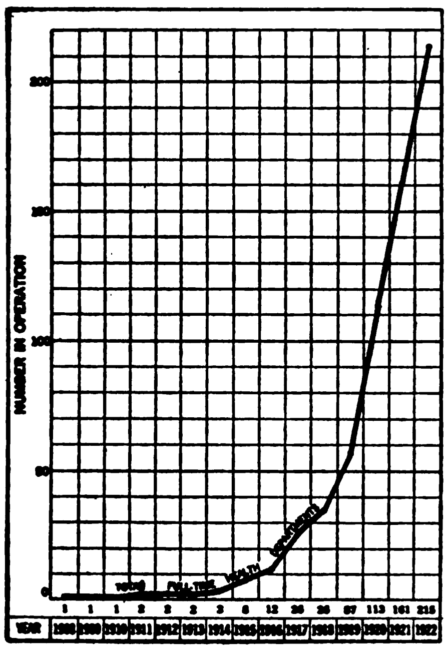


Fig. 26.—Growth in the number of full-time county health departments. Figures indicate the number of departments at the close of each year that had been in continuous operation from the date of their inauguration

the correction of physical defects of school children, to the control of communicable diseases, to infant and maternity health work, to the control of venereal diseases, malaria, and to other tasks.

The record of Troup County, Georgia, is both typical and striking as an evidence of the progressive advantages of organized county health work. Figures for 1917, the year before its health department was organized, showed 486 cases of dysentery. When the department began its work on January 1, 1918, there was not a single sanitary latrine in the county. As a result of the intensive soil pollution campaign the number of cases of dysentery fell to 321, 241, 58, and 29, in 1918, 1919, 1920, and 1921, respectively. In 1922 no cases at all were

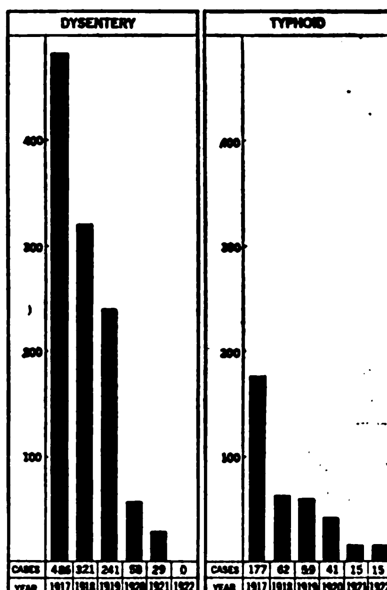


Fig. 27.—Decline in the number of cases of dysentery and typhoid fever, Troup County (Pop. 36,097), Georgia, 1917–1922

reported. Typhoid fever has also practically disappeared from the county. In 1917, 177 cases were reported; in the last two years only fifteen (see Fig. 27, page 141). The county health department wages a fight against all preventable diseases, by soil sanitation, by the use of vaccines and sera, and by the inspection of food establishments and water-supplies. It also provides a public health laboratory service and conducts both health examinations and a program of education in the schools and homes. The expenses of the organization were met at first by joint appropriations of the county, the State Board of Health, and the International Health Board. At present the International Health Board contributes to the work only indirectly through its appropriation toward the support of the Division of

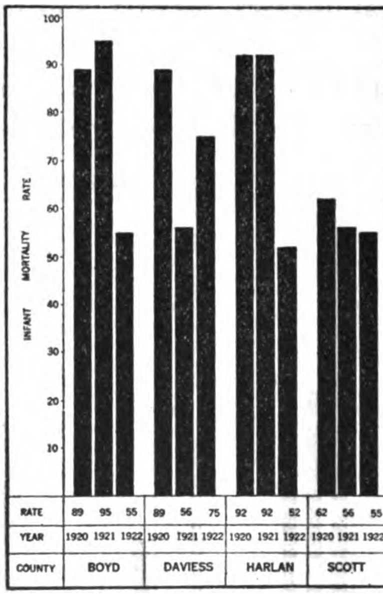


Fig. 28.—Infant mortality rates in four Kentucky counties in which health departments were organized in 1920

County Health Work maintained by the State Board of Health.

The demonstrated value of the county unit is stimulating its development throughout the country. There were at the close of 1922, 215 counties in 26 states employing full-time officers, many of them working on the usual budget of $10,000 a year. The achievements of these units appear in the education of the people, especially those in rural communities, in the principles of health; in the spreading of health knowledge through the machinery of the schools, the press, and personal interviews; in the response of all sections to the obvious value of this work; and in the more accurate collection of vital statistics. All these are progressive advantages. While the Board has followed no predetermined plan of support, it has generally co-operated with the respective states in central administrative budgets providing for salary and traveling expenses of a state director and his secretary, and in additional budgets covering from five to twenty county demonstrations.

A county health organization was established during 1922, in Covington County, Alabama, to serve as a training base for a limited number of new staff members and students in public health whose work will eventually lie in fields where problems similar to those of this region

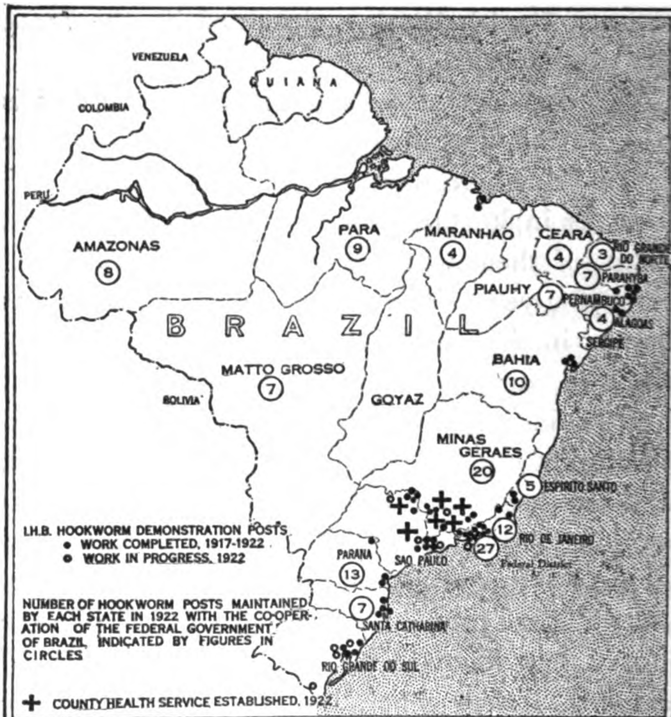


Fig. 29.—Hookworm demonstration posts and county health service in Brazil

must be met. The control of epidemic and endemic diseases, the improvement of sanitary conditions, laboratory diagnosis, popular education in hygiene and instruction in infant welfare work — all fall within the purview of its probable activities. Its budget provides for one full-time county health officer, one full-time public health nurse, an office assistant, and a sanitary

inspector. The expense of this experimental unit will be shared by the state, the county, and the International Health Board.

Organization of County Units in Brazil

During the past year there has been in Brazil a marked increase of interest in the development of county health work. The first unit to be established was that of Orlandia (São Paulo) which inaugurated its work on March 1, 1922. Three months later the Sertãozinho unit went into action. The movement has likewise gained a foothold in the state of Minas Geraes; here four posts were opened during the last four months of the year, and it is probable that as many more will be established during the next twelve months. The Board is co-operating in the work, but under an arrangement whereby the extent of financial aid will diminish yearly through a five-year period, until the responsibility is entirely assumed by state and county.

Already the permanent post of Orlandia has done much to justify its creation. A difficult problem in mosquito eradication was met and solved, latrine construction showed marked improvement, and prompt action by the health officer helped materially in checking a serious epidemic of cerebrospinal meningitis. The work of the four units in the state of Minas Geraes

has been chiefly centered around hookworm control, but the scope of their activities will doubtless broaden as it has broadened in similar county units in the United States.

VII

The Growth of State Services

State health organizations have been assisted in the development of their services. The success of the Division of Sanitary Engineering of the Ministry of Health in Australia and of similar state divisions in Utah and Missouri are gratifying evidences of the value of such co-operative work. Recent requests for aid from Oregon and Arkansas have been approved; and progress has been made toward co-operation in Montana. Where financial assistance is rendered, it is usually with the understanding that legislative appropriations will be secured to cover the cost of the work after a brief period. Thus the Board is co-operating in a two-year program with the government of the province of New Brunswick; a scheme of public health administration is planned which will include statistical and laboratory services, medical and sanitary inspectors, and a corps of visiting nurses working mainly through the public schools.

Following the report of the Wood-Forbes

Commission, which set forth the needs of the health service in the Philippines, the Board was requested to assist in a reconstruction program. Public health training courses have been started; a central nurses' training school has been projected; and a limited number of fellowships have been granted for study in the United States. The Governor-General has attached a medical adviser to his staff. A consultant in nursing and a director of field experiments in malaria control have been appointed.

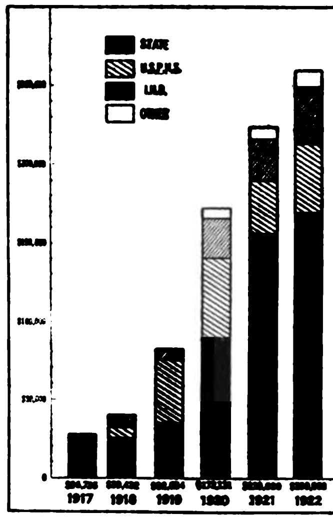


Fig. 30.—Chart showing sources of funds expended by the Alabama State Board of Health, 1917–1922

VIII

Development of Public Health Laboratories

The establishment of public health laboratories is closely bound up with state and county health programs, and with the Board's policy of assisting in the creation of a balanced and complete equipment whereby those units can carry

on the work that they are now by degrees assuming.

The Board will co-operate on an increased budget with a number of states in the establishment or development of central laboratories, and with certain others in the development of branch laboratories. In Canada, preliminary surveys show the need of developing both laboratories and training institutes, especially in the central and western provinces. Support has been given to Guatemala and Salvador for the education of personnel for laboratory work. Arrangements are being made for the maintenance of laboratories in Guatemala, Nicaragua, Honduras, and Salvador. Plans have been discussed for the consolidation of the public health laboratories of São Paulo, Brazil, and their development as part of the Institute of Hygiene

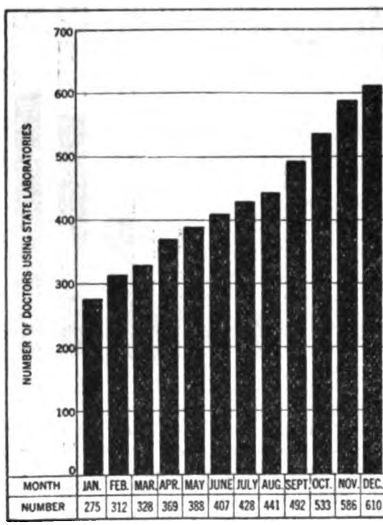


Fig. 31.—Increase in the number of physicians using the laboratory service of the Alabama State Board of Health during 1922

of the São Paulo medical school. In Colombia co-operation may be extended to the Government in initiating a public health laboratory service as an adjunct of the hookworm campaign. Through this means it is hoped that a wide popular interest will be aroused as the basis for government support.

The public health laboratory in Manila, now a part of the Bureau of Science, is to be reorganized, and the Board is lending personnel. In Australia the program for the consolidation of state laboratories has been postponed because of economic depression, but plans have been made for a survey in 1923.

IX

Creating a Public Health Nursing Service in Brazil

Various divisions of the National Department of Health of Brazil, unable to secure trained personnel, have been compelled to employ untrained women in the capacity of visiting nurses. The directors of the bureaus fully recognized the shortcomings of this system, and were anxious for improvement. It has been possible during the past year to assist the Government, not only in the training and supervision of those already employed as nurses, but in the organization of a permanent service of nursing as well.

An emergency course for those already employed was begun in April, 1922. At the end of the year, the opening of the new Government Hospital provided an opportunity for practical work which had not hitherto existed. A special Bureau of Nursing has been constituted under the Department of Health; two zone branch offices have been established in Rio de Janeiro under a well-equipped central office, and it is expected that a national training school for nurses, long under contemplation, will be opened early in 1923. Applications for admission have been numerous and encouraging, but in no sense in excess of the need, for the campaign which has been recently conducted throughout Brazil in order to interpret ideals of nursing to the people, has created a demand which even the new training school can hardly meet. Developments of an important character should take place during the coming year.

X

The Health Program of Czechoslovakia Moves Forward

In the sphere of public health administration the Czechoslovak authorities have shown the qualities of imagination and industry which have been so conspicuously displayed in other branches of the Government. The Division for the Study

Fig. 32.—Public health nursing exhibit at the Brazilian Centennial Exposition. A miniature Ferris wheel carrying six baskets, each showing a public health nurse engaged in a different phase of her work

Fig. 33.—Demonstration by American instructor in the emergency course for visiting nurses in the nursing service of the National Department of Public Health, Brazil

Fig. 34.—First class in public health nursing, Philippine Islands. A training course for public health nurses is one of the first important results of the work of a consultant in nursing sent to the Philippine Islands by the International Health Board at the request of the Philippine Government. Twenty of the forty-eight provinces are represented in this group of thirty students

and Reform of Health Activities in the Ministry of Public Health was created early in 1921. This is a transitional body, acting until its functions can be taken over by a permanent division of the Ministry and by the proposed Academy of Medicine. Nevertheless, in spite of its temporary character, its activities have been numerous and valuable. It has conducted tuberculosis and venereal disease surveys; rural hygiene and public health demonstrations; a study of the nursing situation; educational activities, including typhoid fever and clean milk exhibits; and a project for a survey of the water-supply. It has sponsored a subdivision of public health education in the Ministry, and the creation of a central registry for health affairs in the Republic. It has co-operated with national health organizations and with the American Red Cross Society. The program for 1923, assisted by a larger appropriation from the Government and by additional funds from the Board, contemplates the extension and intensification of present activities.

XI

Co-operation with the League of Nations

While the political implications of co-operation with the League of Nations may be a subject of controversy, its bitterest opponents acknowledge that it has a legitimate function in

the co-ordination of effort against disease. An invitation from the Health Organization of the League to the International Health Board has developed into a program whereby the Board will make funds available for putting the Epidemiological Intelligence Service on a broader and more effective basis during a period of five years. Funds have also been voted by the Board for the international exchange of public health personnel. It is anticipated that in a fixed number of years the value of these two services will be recognized by the states represented in the League of Nations, and that with improved financial conditions they will be able to assume severally the cost of these services.

At the fifth session of the Health Committee of the League, held at Geneva during the second week of January, 1923, reference was made to the co-operation of the Board with the League of Nations, and special mention was made by the Medical Director of certain principles of relationship which the International Health Board had emphasized. "It is a fundamental matter of policy," he said, "that the Board should have no views in determining the Health Organization's policy or programmes or any details of its administration. The Board is interested in keeping in close touch with our service with a view to ascertaining how the

Fig. 35.—A group of health officers from various European countries gathered in London for the second series of international exchanges of health personnel, conducted under the auspices of the Health Section of the League of Nations, with the financial co-operation of the International Health Board

Fig. 36.—A busy day in the public health laboratory, Managua, Nicaragua, established in 1922 by the aid of the International Health Board

Fig. 37.—Part of milk hygiene exhibit, Prague, Czechoslovakia. A highly successful milk hygiene exhibition was organized by a division of the Ministry of Health in Czechoslovakia under the direction of an International Health Board fellow who in 1920-1921 made a study of public health administration in the United States

Board may be serviceable and with a view to keeping advised as to all the expenditures made by the Board. It is refraining from giving any views on such details as the appointment of personnel." And in another connection the Medical Director added: "I believe that the attitude of the International Health Board may be rightly summed up by stating that they would not like anyone to think that they are assuming the right to participate in the discussions of the Health Committee because they have made a contribution to its work." These restatements show an understanding of the principles of action which the Board has always considered fundamental in every aspect of its program of assistance and co-operation, at home or abroad.

XII

Broadening the Base of Health Work by Education

Each successive year of the Board's work has served to confirm the principle recognized at the outset: that responsibility for the prevention and control of widespread diseases must be eventually assumed by government; and that this responsibility can be effectively discharged only through men and women trained in the science of public hygiene.

With this conviction in mind, the Board has in the past few years aided in establishing the

Johns Hopkins School of Hygiene and Public Health; appropriated funds toward the development of the Harvard School of Public Health; assisted the Instituto de Hygiene at São Paulo, Brazil; and made its first contribution toward a similar establishment in Prague. In the early part of 1922, after a careful survey of the field, and in agreement with the Polish Government, the Board voted to contribute funds not in

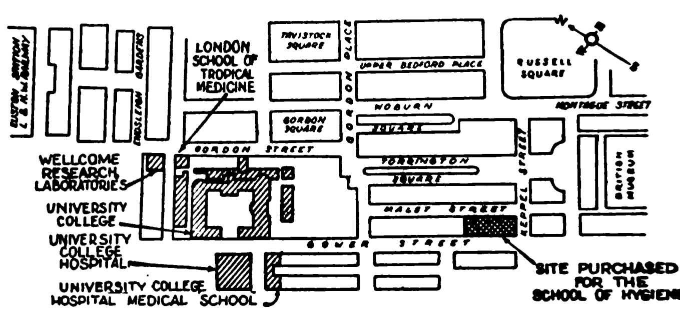


Fig. 38.—Map of a portion of the Bloomsbury district of London showing site of the new School of Hygiene

excess of $212,500 toward a public health building and its equipment in Warsaw, the Government to provide land and annual maintenance. Building operations are already under way, and thus a second permanent establishment for the recreation and extension of sound conditions of health in stricken countries of Central Europe is being developed.

The Board has also agreed to provide not more than two million dollars toward land,

building, and equipment for a school of hygiene in London. After conferences with the Minister of Health and others in London in February, 1922, a site was purchased within easy distance of the British Museum, University College and its Medical School, and in immediate proximity to the site of London University. According to the present program, the School will offer instruction in the theoretical and practical sides of public health, with special reference to tropical disease, and with the probable inclusion of the existing School of Tropical Medicine. Progress in an undertaking of this magnitude is necessarily deliberate, but measurable advance should be made with plans during 1923.

XIII

Extension of Training Through Fellowships

It is obvious that funds for land, building, and maintenance alone are not sufficient to create public health services. Therefore in order to aid in the development of leaders in the field of public health, fellowships have been granted to carefully chosen individuals, with special reference to their fitness for important posts as scientists, teachers, laboratory directors, sanitarians, statisticians, nurses, or administrators in the public health service. For the year 1922, such facilities were provided for seventy-nine

men and women from nineteen countries throughout the world. In most cases fellowships are predicated upon an assurance of the appointment of recipients to positions in this field upon the completion of their studies. The subsequent achievements of the first students already indicate the promising character of the program.

Publications

During the year 1922 the following reports and publications were issued by the International Health Board:

Annual Report for the Year 1921.
Bibliography of Hookworm Disease.

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APPENDIX

I

PROGRESS WITH ANTHELMINTICS

The ideal drug for expelling hookworms has not yet been discovered. Each of the remedies most commonly used has its advantages and its disadvantages. Tests with beta-naphthol early in the year 1921 had suggested that this drug might supplant oil of chenopodium as the drug of choice, but when extensive use of it was begun in the field, thirty-seven cases of severe poisoning with two deaths among 1,064 persons treated in a single locality soon diverted attention to other anthelmintics.

At the close of the year highly promising results were being obtained with carbon tetrachloride and with a combination treatment of this drug with ascaridol, one of the fractions of oil of chenopodium. Until all the properties of these drugs both alone and in combination are satisfactorily determined, however, field workers are justified in continuing to use chenopodium or thymol.

BETA-NAPHTHOL

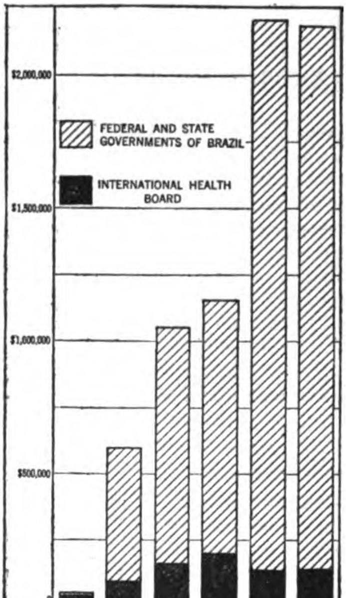
Studies conducted by Caius and Mhaskar in India, 1918–1920, suggested that beta-naphthol possessed a hitherto unsuspected vermifugal character and that a single treatment with it might remove a higher percentage of worms than either thymol or chenopodium. In an inquiry at the Mudis tea estates in 1921, Kendrick and Mhaskar showed that a single treatment of 50 grains removed an average of 90.3 per cent of the approximately 100 hookworms harbored by each person treated, as compared with 78.6 and 86.3 removed by single treatments up to 2 c.c. of chenopodium and 50 grains of thymol, respectively. Moreover, the efficiency of the drug was not lowered when it was given without purge.

Results of Preliminary Tests. In one of the early tests carried out under controlled conditions, fifteen coolies of both sexes and of varying ages and degrees of health were brought to the laboratory after the evening meal and fasted until the trial drug was administered the following morning. Beta-naphthol and thymol were given in powdered form in a single dose of fifty grains as a maximum, accompanied by twenty-five grains of light magnesium carbonate washed down with a draught of water. Oil of chenopodium was given in single doses up to 2 c.c. An hour later the subjects were given Epsom salts. Thin rice gruel was allowed during the day and more substantial food in the evening.

All stools were saved under surveillance for forty-eight hours from the time of treatment, and the number of worms recovered was noted. Two subsequent treatments were given at intervals of a week to a fortnight,

either thymol, beta-naphthol, or oil of chenopodium—the latter in single 3 c.c. doses—being used to remove the worms left by the trial treatment. The results of the test indicated that, in the dosages used, beta-naphthol was a better worm-remover than either thymol or oil of chenopodium.

Later field tests on the Mudis tea estates, in which oil of chenopodium was given to 2,198 cases, thymol to 1,606 cases, and beta-naphthol to 872 cases, produced substantially the same results. The conclusion reached was that treatment with beta-naphthol was simpler, safer, more economical, and more efficient than treatment with either thymol or oil of chenopodium. Subsequently, Leach and Hampton, in Ceylon, tested beta-naphthol and obtained fair results, though not so favorable as those of Caius and Mhaskar. In an experiment to test the comparative efficiency of beta-naphthol and chenopodium, Burnell in Brisbane, Australia, found that beta-naphthol in 50-grain doses yielded negative results, while the use of chenopodium in doses of 1.5 c.c. resulted in the recovery of 57 per cent of the worms after one treatment.



YEAR	1917	1918	1919	1920	1921	1922
TOTAL	$55,865	$597,031	$1,076,430	$1,143,560	$2,204,287	$2,191,852
FEDERAL AND STATE	$12,556	$500,000	$921,000	$950,000	$2,072,500	$2,045,000
I.H.B.	$43,309	$97,031	$155,430	$193,560	$131,787	$146,852

Fig. 39.—Increase in financial support for rural sanitary service in Brazil, 1917–1922, including appropriations of federal and state governments and expenditures of International Health Board, but excluding the budgets of six county health departments inaugurated in 1922

Serious Poisoning Produced when Used in Field. Darling, Barber, and Hacker had reported adversely upon beta-naphthol following their tests with this drug in the Orient in 1915–1917. When Gonzaga and Lima, in Brazil, had developed a dosage and method of administering it that held promise of yielding excellent results, Smillie submitted the drug to experimental tests and demonstrated that in efficient dosages it destroyed red blood-cells and when administered to cases with active or latent malaria infection the drug produced toxic symptoms of the most serious nature. In 1921, following the favorable reports from India, he again submitted the drug

to test, using the dosage and conditions of treatment recommended by Caius and Mhaskar, and obtained the same unfavorable results as before.

When the campaign workers in India moved to a group of estates on which malaria was very prevalent, their experience was largely a repetition of that anticipated by Smillie. Of 585 males and 479 females treated with beta-naphthol, thirty-seven developed burning sensations in the epigastrium, nausea, occasional vomiting, diffuse abdominal pain, jaundice, diarrhea, or dysentery, great weakness, and pain on micturition. Thirteen cases suffered much more than did the rest, and two of them died. Carminatives were administered, and most of the symptoms disappeared in from three to eight days after treatment.

CARBON TETRACHLORIDE

Interest in the use of carbon tetrachloride, a new vermifuge similar to chloroform in chemical construction and toxic action, as a remedy for hookworm disease has become widespread during the two years that have elapsed since Hall first drew attention to the remarkable anthelmintic properties of the drug. In experimental treatment of dogs and monkeys he obtained almost complete expulsion of worms with no outward evidence of toxicity in doses up to 1.5 c.c. per kilogram of body weight. Later, Smillie and Pessoa tested the drug on dogs in São Paulo, administering massive doses of 6, 8, and 10 c.c. without purge, and found that the only symptoms produced were slight dizziness, abdominal distress, and in one case vomiting. There were no obvious macroscopic lesions of the organs when 3 to 6 c.c. were used. Even 6 to 10 c.c. doses, though they rendered the animals dizzy, did not kill them, and this in spite of the fact that, reasoning from the similarity of carbon tetrachloride and chloroform, one would expect dogs to be not only more susceptible than human beings to the toxic effects of the drug, but particularly susceptible to small doses frequently repeated.

Hausheer, in Dutch Guiana, reported that two treatments in doses of 5 c.c. cured ten dogs, while on another occasion dogs about five kilos in weight took 15 to 30 c.c. on two or three successive days without perceptible clinical symptoms. His experience coincided with the conclusions reached by several others whose observations had been based on symptoms alone, or upon examination of the organs one or more months after treatment; namely, that even in large doses of 10 or sometimes 15 c.c., the drug is non-toxic to dogs.

Possible Ill Effects. However, in São Paulo, Brazil, a few cases of poisoning in the early experimental treatments administered to human beings suggested that the drug might possibly be injurious to the liver and kidneys, and led Meyer and Pessoa to carry out a further series of careful experimental treatments on dogs. In one series of experiments with eight dogs they examined the liver and kidney tissues microscopically after the animals had been killed, and found that although there was no outward evidence of toxicity, doses as low as .05 c.c. per kilo of body weight did,

nevertheless, produce definite fatty degeneration of the liver and kidneys. The degree of degeneration was markedly increased when the treatment was repeated at short intervals. Regeneration of the liver was rapid, requiring only twenty to thirty days for complete healing, but the injury to the kidneys could still be plainly seen after the expiration of this period.

Efficiency. Of the fact that the new drug possesses remarkable anthelmintic properties there can be little doubt. It seems to be almost specific for hookworms, at least Necators; and to effect, in addition, a fairly satisfactory removal of other nematodes. It has a selective action against female Necators, differing in this respect from oil of chenopodium. It is not known to be equally effective against Ancylostoma; and it may be significant in this connection that investigators in localities where Ancylostoma predominate have not reported from the use of the drug the same satisfactory results that have been obtained in countries where the worms are mainly Necators. The preliminary experiments indicate that a single treatment with doses as low as 2 c.c. eliminates more than 90 per cent of the hookworms harbored. As the dosage decreases, however, male hookworms and Ascarides are less and less affected by the drug.

Dosage. Doses ranging from as little as 1 to as much as 14 c.c. have been administered by various experimenters. Escobar gave 4 c.c. daily or every third day until nine treatments had been taken—a total of 36 c.c. In some cases he mentions giving as much as 50 c.c. of the drug to a single individual. From the standpoint of efficient worm removal, however, there seems little need for a dosage larger than 3 c.c., while from that of toxicity there is much evidence to show that the higher doses are not without grave dangers. Indeed, it seems altogether probable that ultimately the optimum dose, from the standpoint of toxicity as well as of worm removal, will be found to be about 2 c.c. In practically all the experiments children have stood their proportionate doses better than adults.

Interval Between Treatments. Intoxication may result if the drug is given at frequent intervals. This is because its maximum toxic effect is exerted on the second or third day following treatment. Moreover, the action is cumulative, and Smillie has shown that in dogs repeated small doses as well as large single doses may result fatally. Under no condition should the second treatment be administered until an interval of at least three weeks has elapsed, and there is good reason for questioning whether it is necessary at all. The experimental work has suggested the probability that the worms that resist first treatment will resist the second treatment also and have to be expelled by another anthelmintic.

Method of Administering. Most investigators have administered the drug in capsules, but it may also be given by covering it with water and having the patient swallow it quickly. The latter method saves a great deal of time in dispensing and in administration. It is preferable that the drug shall be freshly encapsulated daily because it

Fig. 40.—Making hemoglobin tests to determine the severity of hookworm disease in Honduras

Fig. 41.—A hookworm dispensary in Ceylon. Since its organization in 1913 the International Health Board has conducted campaigns for the relief and control of hookworm disease in thirty-eight governmental areas

Fig. 42.—Part of the hookworm staff employed in Porto Rico

Fig. 43.—A scene in a village of Mauritius on treatment day. The villagers are keen to take the hookworm treatment

evaporates so rapidly that the proper dose may not be given. The doses have been given either singly or divided into two or three parts and administered at hourly intervals, with nothing as yet to show superiority for the divided dosage.

Purity. It is of course of the utmost importance that only a drug of the highest purity be used. In Fiji, where 42,000 patients were successfully treated with one lot of the drug, three deaths resulted among the 8,000 patients treated with a second lot, which the analysis of the government chemist revealed to be impure. The fact that the drug can be prepared in a high degree of purity makes it all the more important that due diligence be exercised to guard against the use of an impure product.

Preparation of the Patient. Diet restriction is not essential. If the patient is constipated, a mild laxative on the preceding night may be beneficial, and some of the experimenters, notably Lambert, have found a post-purge of much assistance as a means of reducing unpleasant after-effects. The patients may eat within one or two hours following treatment, and may also continue with their usual work or play.

Purgation. From the early experiments one may say that it seems to make little difference whether the patient receives a preliminary purge; the cathartic action of the drug itself eliminates to a large extent the need of subsequent purgation. It is largely immaterial, from the standpoint of worm removal, whether the post-purge is given or withheld. Such experimenters as have administered it have usually done so merely to aid elimination of the drug and reduce its toxicity; until the question is settled it may be advisable to follow treatment with a purgative.

The whole question of the rate and manner of absorption of the drug, however, remains in need of fuller investigation. Smillie believes, for instance, that it is absorbed almost immediately on administration and is largely excreted by the lungs, while Hall thinks it is slowly absorbed, and will, if a vigorous purge is given, be almost completely eliminated in the feces. Until these points are satisfactorily determined it will be difficult to decide whether or not the after-purge is needed, and, if it is, the most suitable interval that should elapse between administering the doses of the anthelmintic and the purge.

Toxicity. In most countries few obvious symptoms resulted from the experimental treatment. Hall, in one of his early articles, reported taking 3 c.c. of the drug without inconvenience to himself, and Leach subsequently gave a dose as high as 10 c.c. to a condemned criminal without producing serious external symptoms. At autopsy of the executed prisoner, twenty-two days later, no macroscopic lesions of the liver were seen. Lambert, in his first 42,000 cases, attributed what few symptoms were produced to failure to take salts. He pointed out that constipation was caused by taking food or alcohol soon after treatment, with the result that in many cases drug absorption followed. He relieved the symptoms by free purgation with magnesium sulphate.

It was Smillie who first called attention to the fact that in certain cases carbon tetrachloride might be expected to produce fatty degeneration of the liver. He had two such cases in his first series of experimental treatments in man. Both were alcoholics, whose livers had probably already been seriously injured. The symptoms appeared within twenty-four to forty-eight hours after ingestion of the drug and were followed by rapid regeneration and complete recovery. Both cases began with mild symptoms of generalized muscular pains, slight fever, and abdominal distress, within thirty-six hours of treatment. In one case the symptoms were more severe and of longer duration, with the appearance of a slight, transient hematuria on the third day. Subsequently, in the São Paulo treatments, there was a third case of poisoning in a young adult who had consumed a large quantity of alcohol the day before treatment. The drug produced no immediate effects, but after thirty-six hours had elapsed the patient began to have severe symptoms which ran a course very much like that of the other two cases.

Deaths from the Drug. The first 42,000 treatments administered in Fiji were attended by no serious results of any kind. Among the next 8,000 treatments administered following receipt of a new supply of the drug there were, however, in one small area, a number of cases of serious illness and three deaths: the first in an East Indian boy of seven, the second in an East Indian boy of five, and the third in an East Indian woman. In all three cases the livers were examined at post-mortem and showed necrosis and fatty degeneration. From Australia an additional death, possibly also due to carbon tetrachloride poisoning, has been reported—that of an insane girl who was given 2 c.c. and a week later 4 c.c. of the drug, and who died on the third day following the second treatment.

Darling, who has had opportunity to examine microscopically the liver and kidney tissues taken at autopsy from the first child that died in Fiji, reports that "the lesions observed, unquestionably caused by carbon tetrachloride, are like those seen in man in necrosis of the liver from chloroform poisoning after anesthesia, in experimental liver necrosis in dogs following chloroform anesthesia, and after injections of chloroform into the portal vein and hepatic artery." He has also examined the liver of the criminal executed in the Philippines, to whom Leach administered 10 c.c. of the drug, and reports that "it is not a normal liver by any means." Instead, it shows "slight but definite damage from some cause, the changes being of the same nature as those seen in the Fijian boy and in dogs treated with carbon tetrachloride." His experimental work leads him to the conviction that the slight disturbance of function outwardly manifested in cases of tetrachloride poisoning may be out of all proportion to the lesions that may be seen on microscopic examination of the tissues.

It will be evident from the foregoing that the use of the drug is not without dangers, and that care in its administration is necessary. It has a toxic action upon the patient somewhat similar to that of chloroform. The first stages are dizziness, slight nausea, headache, and somnolence. These are usually transient. A later and more serious manifestation is

fatty degeneration of the liver, which first manifests itself two to three days after treatment. It is important, therefore, that the patients be kept under observation for at least forty-eight hours after treatment. The condition rarely occurs, however, and is seldom fatal. There is wide variation in individual reaction to carbon tetrachloride, alcoholics being particularly susceptible to the toxic action of the drug.

Advantages. To sum up, then, it may be said that the early experience seems to indicate that carbon tetrachloride is a better drug for the treatment of hookworm disease than chenopodium, thymol, or beta-naphthol. In doses of 2 c.c. for adults it is extremely efficient in the

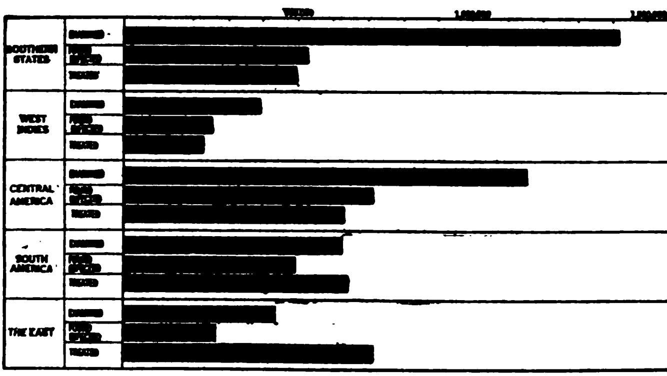


Fig. 44.—Persons examined, found infected, and treated in the Board's world-wide campaign against hookworm disease, 1910–1922, inclusive, by main geographical divisions

removal of worms and there is less probability of serious intoxication or even severe symptoms than by routine treatment with chenopodium in 1.5 c.c., thymol in 3-gram, or beta-naphthol in 4-gram, doses. The only exception to this rule appears to be found in those cases in which the liver has been weakened by alcohol or other causes.

The drug is palatable, making it less difficult to induce patients to accept treatment than the other remedies. Its definite chemical composition makes it preferable to compound drugs of herbaceous origin. Moreover, apart from the economy it effects through the ease and cheapness of its administration, the drug itself is considerably less expensive than either thymol or chenopodium.

In Ceylon it was given to a number of children who had previously been treated with oil of chenopodium on one or more occasions, with the result that it removed all or a large proportion of the worms that had remained after chenopodium treatment. It may also, apparently, be safely given in pregnancy, when other remedies are contraindicated. In Fiji hundreds

of pregnant women have been treated with carbon tetrachloride without a single reported case of abortion, and in Ceylon a number of anemic and emaciated children who had fever from various causes were treated with excellent results.

ASCARIDOL-CARBON TETRACHLORIDE TREATMENT

In an attempt to avoid the dangers of the larger doses of carbon tetrachloride, and at the same time to utilize the recognized effectiveness of small doses of chenopodium against male Necators and against Ascarides, Smillie and Pessoa conceived the idea of using small doses of a mixture of three parts carbon tetrachloride to one part ascaridol, giving 0.1 c.c. of the mixture for each year of age up to twenty years. Ascaridol is the active anthelmintic principle of chenopodium, found in the drug in proportions varying from 50 per cent to 70 per cent of the whole. In fifteen cases a single treatment removed almost 98 per cent of the hookworms present. Very mild symptoms were produced, only one or two cases experiencing slight dizziness lasting but a few moments.

The new treatment is being subjected to further study in other countries, where the earlier reports have been uniformly favorable. In the opinion of Smillie the results so far obtained offer the hope that the combination of carbon tetrachloride with ascaridol in a single treatment will prove more effective in the elimination of hookworms and less toxic to the patient than any other method of treatment yet devised. There remain, however, many technical difficulties to be overcome and much additional experimental work to be done before definite conclusions can be announced.

II

MASS TREATMENT

Early Hookworm Campaigns of the Board. When the Rockefeller Sanitary Commission was established in 1909 for the purpose of combating hookworm disease in the Southern States the work of relief and control was carried on at first through the traveling dispensary which provided examination and treatment for all who applied. Later the dispensary gave way to a standard form of organization which conducted a more intensive campaign, carrying the work by house-to-house canvass into every corner of a county and remaining in contact with the infected until all possible cases were cured. The essential features of the latter type of campaign are microscopic examination of specimens of feces from the entire population and treatment of each person found infected until ova are no longer detected by the microscope. An educational program invariably accompanied the curative work, designed to prevent reinfection by stimulating the building of latrines and reduction of soil pollution.

The success of the hookworm control effort in the Southern States brought invitations to extend it to other countries where, first in British Guiana in 1914 and later in many other parts of the world, essentially the same intensive plan of operation was adopted.

Under conditions approximating those found in the United States, and on the basis of the then-existing knowledge of the bionomics of the parasite, this so-called intensive work within well-defined areas offered the most effective plan of operation. It seemed to be calculated to diminish human infection almost to the zero point within a comparatively short period, and, through the educational and sanitary campaign, gave a high degree of assurance of yielding lasting results.

Experience and New Knowledge Modify Procedures. Longer experience in the countries where work was begun nearly a decade ago, and the more recent work in many important tropical countries, combined with the results of recent scientific studies of the life of the parasite have pointed to the desirability of modifications in the plan of conducting hookworm campaigns. It is the lesson of experience that too much stress should not be laid on achieving completeness in the original campaign, for it is now realized that only in the course of years is it possible to reach the goal of freedom from the disease. The primary object of a campaign is still the relief and cure of as many persons as possible, but equally important to that is the demonstration to the population treated and to their untreated neighbors that there is such a disease, that it is easily amenable to treatment, and that it can be prevented by sanitary precautions. The treatment campaign is thus the most practicable entering

wedge for the educational work which alone can free any community from hookworm disease.

Limitations of Microscopic Diagnosis. Less emphasis has also come to be placed on completeness in the curative work because the practical limitations of microscopic diagnosis are better understood now than a decade ago. Studies of the accuracy of the examination of feces for ova by microscopic techniques have shown that it may fail to detect

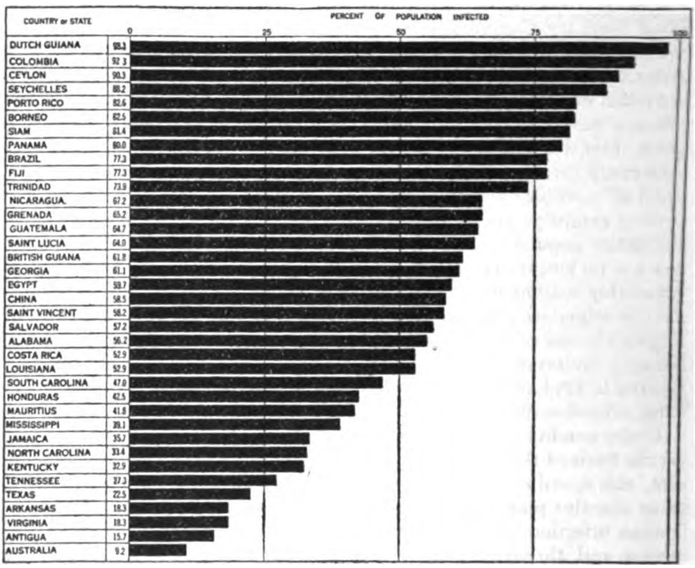


Fig. 45.—Infection rates in various states and countries as disclosed in the Board's treatment campaigns, 1910–1922

infection in a small percentage of cases. This means that some light infections are missed in the original examination and that a considerable percentage of cases reported as "cured" still harbor a few worms and are therefore likely to reinfect themselves and others unless soil pollution can be prevented.

Untreated Cases as Carriers. The simple theory on which a hookworm campaign aims at immediate eradication of the parasite has also to face the fact that however intensive the campaign a certain percentage of those found infected cannot be treated at all but remain as carriers to cause reinfection. Cases reported to the Board as not treated either for medical reasons, or because treatment was refused, or because

the patient had removed or could not be located, amounted in the three years 1920 to 1922, to 10.3 per cent of all those found infected. In some countries the proportion ran as high as 25 per cent in certain years, the principal cause being the patient's refusal.

These untreated cases are usually more dangerous as carriers of infection than the cases so lightly infected that they escape detection by microscopic examination or than the light infection remaining after a single treatment by means of an efficient anthelmintic. Reinfection is a slow process even with heavy soil infestation. If all carriers are but lightly infected, therefore, reinfection is less likely to occur, particularly if soil pollution is controlled.

Hookworm Infection versus Hookworm Disease. Until recently the rate of infection, that is, the percentage of the population whose feces are found positive on microscopic examination, has been the controlling fact in treatment campaigns. This infection rate has been used to measure the extent of the problem in a given country or area, as well as to test the effectiveness of the work after a period of years. But it has become quite clear that this rate of infection alone does not distinguish accurately enough between light and severe infections nor does it furnish a satisfactory test of the result of a treatment campaign for the population as a whole.

The importance of an accurate measure of the severity of infection is discussed in the following chapter. The point to be made here is that a difference between light and heavy infections should be recognized in planning campaigns against the disease. A distinction has even come to be made between hookworm infection (the presence of a few worms) and hookworm disease (the result of a severe infection). Smillie finds in general no clinical manifestations of disease in patients harboring less than forty hookworms. Darling is of the opinion that communities in which the hookworm index (average number of worms harbored by adults) is less than fifty do not urgently require treatment. Treatment campaigns consequently should be directed primarily toward the relief of populations suffering from more severe infections. Educational work, introduced and aided by treatment, accompanied by all practicable methods of preventing soil infestation can be relied upon eventually to eliminate even the light infections.

Reduction of Soil Infestation by Mass Treatment of the Infected. The significance of a heavy soil infestation and the importance of reducing it as rapidly as possible have not until recently been fully appreciated. Darling and others have pointed out that there is a close correlation in any area between the severity of infection and the degree of soil infestation. Worms harbored by the individuals in any community are derived from larvae in the soil and the severity of infection is in direct proportion to the degree of soil infestation. Heavy infections do not develop in communities with a lightly infested soil. The larvae do not multiply in the soil nor even live in the soil for more than eight or nine weeks. Infection, moreover, is but slowly acquired, even where soil in-

festation is high. It is therefore possible to bring about at once a light infection and resulting low soil infestation by treating the whole of the population in a heavily infected area *en masse*.

"If an entire community," in Darling's own words, "could be treated in a few days, the community's environment would suddenly be purified of most of its larval infestation, and the community would be placed in the class of those places which have low indices (average number of hookworms harbored) and low larval indices (degree of soil infestation). A community once placed in this advantageous situation, there is every reason for believing that it could stay in it just as other communities are remaining with low larval indices at the present time. For, once a village has a low index, it cannot acquire a larger one without an influx of heavily infected persons from without."

If only a portion of the heavily infected are treated, the remainder will inevitably keep up soil infestation so that in the minimum length of time severe reinfections will take place. Campaigns must therefore be speeded up, so that reinfection from the still heavily infected cannot occur. "Not only is it more humane," says Darling, "to treat the heavily infected persons first; but by this means the correspondingly heavily infested soil is treated as well, and a source of infection of great magnitude is removed." By rapidly removing most of the worms from a heavily infected population it is possible practically to free the community from the burden of hookworm disease, and so to reduce further soil infestation within the period of life of the larvae already in the soil, that there is no possibility of the rapid recurrence of severe infection. Thus, by treatment *en masse* a great step forward can be taken in soil sanitation and control of the disease without the long delay and heavy expense of securing in advance the construction and use of latrines.

Mass Treatment for Heavily Infected Areas. Confronted by the conditions outlined above and aided by a better understanding of the biological aspect of the problem, the directors of hookworm campaigns in heavily infected tropical countries have in a number of instances dispensed altogether with preliminary microscopic examination of feces. Where it is known that practically every person is infected they have treated the people *en masse* without preliminary diagnosis. Darling and his co-workers of the Uncinariasis Commission to the Orient in 1915–1917 reached the definite conclusion that in tropical regions or mines where a high incidence of infection prevails, "the population should be treated *en masse* by an intensive method and probably without the unnecessary preliminary of examining the stools for ova."

Caius and Mhaskar, in their study of ancylostomiasis in the Madras Presidency, which began in 1916, under the auspices of the Indian Research Fund, found the traditional mode of treatment too costly and time-consuming as well as too stringent for the masses with whom they had to deal, and undertook, therefore, to work out a simple and effective therapy which would not involve interference with people's work, and could safely be used for all persons indiscriminately without previous microscopic

Fig. 46.—*Upper left:* the "Headman" of a village in Ceylon, with his family. These local authorities have much to do with the success of hookworm campaigns; *Upper right:* a native of the Fiji Islands taking the treatment for hookworm disease; *Bottom:* showing actual hookworms through a microscope to the native people of a tropical country to induce them to take treatment for the disease

Fig. 47.—Hookworm control unit on inspection tour in northern Siam

Fig. 48.—A dispenser talking to a group of natives gathered for hookworm treatment in Siam

examination in each case. The chief aim of this investigation was to find the most efficient drugs for giving mass treatment to large agricultural labor forces.

Brazil. The first application of mass treatment for hookworm control in Brazil was made during the fall of 1920 in a thinly settled, strictly rural community in Santa Catharina. The infection rate varied from 85 to 69 per cent; the people were very ignorant, and the cost per person was seriously high. After some 2,000 microscopic examinations, not more than twelve persons had been found free from all parasites. Mass treatment was therefore adopted, and subsequently extended to other places in southern Brazil. Resurveys of certain communities, the Ilha do Governador, an island in the bay of Rio, and the town of Jacarepagua, the latter in a zone of heavy infection, indicated a very slight reduction in the rate of infection. In the original campaign, in Ilha do Governador 71.2 per cent of the population were found infected, while in the resurvey, the rate was still 69. The average number of hookworms harbored per person, however, among those who had been treated was greatly reduced—from 324 worms for a group of untreated controls, to 14 for the treated cases. Dr. Smillie concluded therefore that hookworm disease, as a disease, had practically disappeared from these communities, and that it was futile as well as superfluous to attempt to eradicate this small number of worms in zones of heavy infection. A standard treatment once a year, even where construction is not practicable, would be an effective prophylaxis, in his opinion.

Siam. Mass therapy has also been adopted in Siam. In survey and health propaganda work all applicants for treatment are required to submit fecal specimens for examination. In the control campaigns, however, omission of the microscopic examination has been found clinically justifiable. In certain changwats (states), a universally high rate of infection is found, not only for hookworms, but also for other intestinal parasites, so that practically every one is benefited by treatment. The relative efficiency of the intensive method of treatment and mass therapy has been put to a thorough test in Siam, where the former was largely used in the campaigns up to 1920. In one aumphur (county) only 500 treatments could be administered in three weeks by the intensive method. Mass treatment was then introduced, and in the next six weeks over 5,000 treatments were given. All subsequent control campaigns have therefore followed the mass treatment procedure.

Fiji. In Fiji it was found that the natives were willing to take the medicine, but refused to submit specimens, so that few stool examinations could be made. Mass treatment was therefore adopted. In the Suva district the aim was to give a treatment to every person except the Europeans, who were invited to come to the laboratory if they desired treatment. Indian and Fijian assistants were used, who could work with little friction among their own races. Through the economies effected by mass treatment, in combination with the use of carbon tetrachloride, Dr. Lambert was able to treat over 50,000 cases in Fiji during a period of about eight months.

Techniques having the essential features of mass treatment have also been utilized in Java, Sumatra, British North Borneo, Papua and New Guinea, and Ceylon, though not on the same scale as in Brazil, Siam, and Fiji.

Definition of Mass Treatment. The term "mass treatment," in the technical sense in which it has come to be used in hookworm control, includes two distinguishing features: (1) the omission of preliminary diagnosis; and (2) a single treatment, in the field rather than at a fixed point, of all persons who can be reached in the community or occupational group within a brief period. The term is not applied to the treatment of persons in "masses," or groups, however large, unless these two features are present. In Malaya, for example, Tamils were treated at Port Swettenham in groups of forty, but all of them had previously been examined. In the decade before the War, German colonial authorities in East Africa had a highly developed health service and conducted extensive antihookworm operations. In their official reports they used terms which might be translated as "mass treatment," but it is clear they meant merely treatment in large groups.

The first clear instance of mass treatment referred to in the literature was in 1914, when Schüffner, a leading sanitarian of the Dutch East Indies, treated more than 5,000 coolies on the plantations of Sumatra with oil of chenopodium. Thousands of laborers were examined by the microscopic method and not one was found negative. Infection was therefore deemed general and without examination all coolies were treated forthwith in groups of about 200. Schüffner recommended that all coolies be given a second general mass treatment after three months and a third after nine months.

Economy of Mass Treatment. The economic advantage of mass treatment cannot fail to appeal to all agencies, official and unofficial, engaged in hookworm campaigns. The economies which it effects in personnel and equipment make possible a great expansion of the control work that can be conducted with a given appropriation, and apparently without sacrificing anything in the way of immediate or permanent benefits to the population treated.

The omission of microscopic examination at once eliminates the necessity for a number of microscopists, from one to three of whom are required in a standard control unit. They are naturally a more expensive form of labor than other assistants, since they require a considerable degree of intelligence, general education, and special training. While microscopy is still necessary in the preliminary survey of a new area, and in providing diagnosis for persons who request it, this part of the work is vastly reduced. Microscopic examination involves much record-keeping and a great deal of secretarial work in connection with specimens, follow-up, etc., most of which is eliminated in mass treatment.

The greatest saving, however, is in the time of the nurse. A single nurse or field assistant can by this method care for a much larger number of persons than by the method ordinarily employed. The radius of action

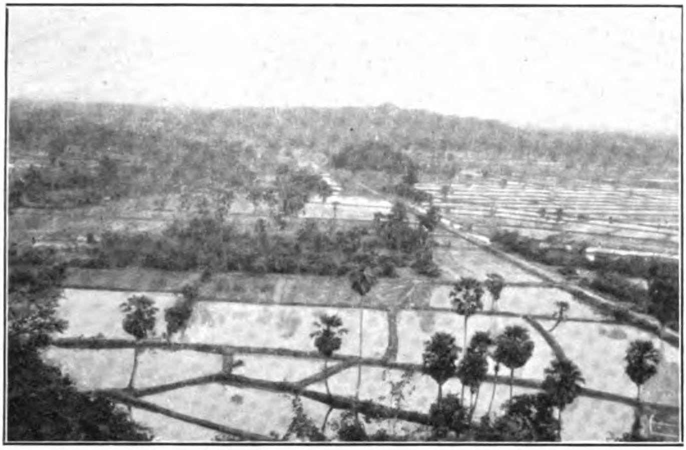


Fig. 49.—Fighting malaria by the control of mosquito breeding presents great difficulties in a rice-growing country

Fig. 50.—The Ubiquiteers, "Men from Everywhere," an international public health fraternity organized in 1922 in the School of Hygiene and Public Health of Johns Hopkins University by the holders of International Health Board fellowships. In the year 1921–1922 these fellows represented more than a dozen countries

Fig. 51.—Staff of a county health department examining school children to discover physical defects

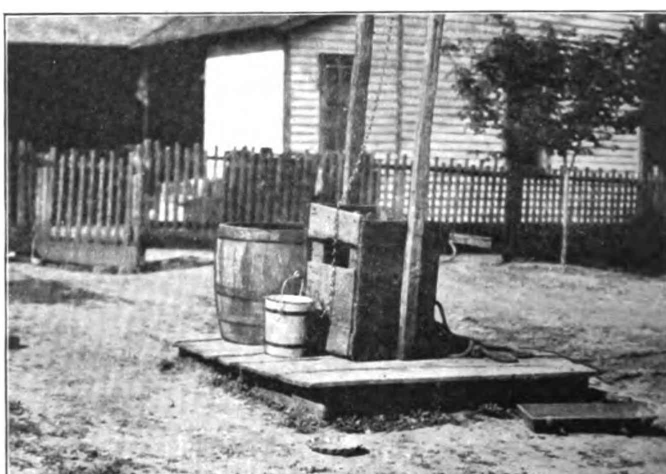


Fig. 52.—A danger to health. An old-fashioned well unprotected from surface pollution

of the nurse can also be greatly increased. Outlying, sparsely settled areas need not be neglected because of the high cost of operating in such regions. In Brazil it was found practicable under mass treatment procedure for nurses to be stationed as much as a day's journey from the post and not required to return more than once in two weeks. They were, of course, frequently visited by supervisors.

Population More Easily Induced to Take Treatment if Examination Omitted. In regions where the plan has already been tried it has been found that persons who refuse to submit fecal specimens are yet quite ready to take treatment if the preliminary examination is omitted. False modesty, irregular habits of defecation, and other conditions render it difficult to secure specimens for microscopic examination. Uneducated people are glad to take the treatment, once they are persuaded that it is worth taking; and frequently logical arguments or scientific proofs are less effective than good-natured persuasion by a clever nurse, or observation of improvement in neighbors who have been treated.

Many are also deterred from taking treatment under the old intensive method because of the time and effort required of the patient. It was found impossible in Honduras, for example, to keep up the interest of a large element in the population. For the first few weeks after the opening of a dispensary there would be a rush of patients eager to rid themselves of intestinal parasites. But the routine of collecting samples, examination, treatment, the necessity of returning at intervals for reexamination and treatment, the rather stringent limitations on diet, and the perhaps disagreeable vermifuge and cathartic, all combined to make treatment a serious ordeal that weakened the original enthusiasm and led many persons to grow discouraged and abandon their purpose. With mass treatment one dose of an efficacious vermifuge is all that is required. This can be given before interest wanes and if 60 per cent of the population are induced to take treatment at once most of the remainder will be influenced to do so by friends and leaders.

The sheer loss of time is also a factor, for, if not important to the native himself in undeveloped countries, it is often a controlling consideration to managers of large plantations whose employees are to be treated.

Treatment for Other Parasites. Infection with the hookworm is usually accompanied by infection with other intestinal parasites, such as *Ascaris lumbricoides*, *Trichuris trichiura*, *Strongyloides stercoralis*, *Oxyuris vermicularis*, and *Taenia saginata*. A search for these species is seldom made except incidentally in the examination for hookworms. Estimates of their incidence are therefore liable to err on the side of conservatism. Ascaris is probably the most important clinically. In southern Brazil between 60 and 70 per cent of the population are infected with Ascaris, and the infection is heavy among young children who do not harbor a large number of hookworms. With this overlapping of infection from the two main parasites, it may be seen that almost 100 per cent of the population suffer from some variety of helminthiasis, those having hookworm frequently being negative to Ascaris, and vice versa. Under these

conditions it is evident that, with the proper vermifuge, mass treatment cannot but benefit practically the entire population.

Sanitation. The adoption of mass treatment procedure does not imply any relaxation of effort to prevent soil pollution. Proper sanitation is the only permanent method of preventing hookworm infection. A control demonstration to be successful must result in the introduction of sanitary methods of disposing of night-soil. In many countries, however, and particularly in countries in which soil pollution is greatest and the disease most severe, it has been found exceedingly difficult or impossible to secure the construction and use of latrines either in advance of the curative work or immediately following it. When this is the case it has in the past been deemed inadvisable to undertake hookworm campaigns. Under such conditions mass treatment repeated at intervals will accomplish much, as pointed out above, in the elimination of heavy infections, even in the temporary absence of adequate latrine construction.

Hookworm control campaigns have usually started with a program of education and latrine construction. After latrines have been in use long enough to effect a reduction in soil infestation the treatment campaign is begun. Many of those engaged in hookworm work have come to believe, however, that the benefits are so great as to warrant mass treatment even where the sanitation program cannot be started immediately. The normal degree of soil infestation is reduced in winter or during a prolonged dry season, the larvae being unable to withstand continued cold or drought. Cort has therefore suggested that advantage may be taken of these periods of naturally low infestation to begin a campaign of mass treatment and thus secure a minimum of reinfection even in the absence of soil sanitation measures.

Conditions for Mass Treatment. Mass treatment cannot, of course, be used indiscriminately under all conditions. Its success will depend on intelligent adaptation to circumstances and a wise choice of methods. No standard procedure has been worked out, but many field workers are experimenting and an increasing degree of accord as to the essential features of the new plan may be expected. The Board does not prescribe the methods to be followed in any area, preferring merely to make suggestions and rely upon the judgment of its field directors.

Upon entering a new region it will always be necessary to examine representative groups of the population. If 75 per cent or more of these persons are infected it may be assumed that approximately universal infection exists and that further examinations will add nothing to the information needed. The next step is a short, intensive educational campaign, giving the widest possible publicity to the results of the preliminary survey and offering treatment to everyone without further examination. In regions where mass treatment has been tried no criticism has ever been encountered because of the omission of individual diagnosis. Microscopic examination of feces and hemoglobin determinations should be

made, however, either before or after treatment for everyone who wishes them.

Local conditions will always determine whether the dispensary or a more intensive system is to be used. Certain areas it is best to cover rapidly, treating only the willing and returning to treat those who are convinced later by the experience of friends who have taken the treatment.

III

MEASURES OF SEVERITY OF HOOKWORM DISEASE

Reference has been made above (page 179) to the importance, in planning hookworm control campaigns, of adequate information as to the severity of the disease. During the period in which the Board has been engaged in work for the control of hookworm disease, the need of an accurate and reliable measure of severity in the individual case, as well as the degree of infection in the community, has become more and more apparent. The development of scientific knowledge of the disease which has gone hand in hand with the extension of control campaigns has shown that in hookworm disease more than in any other widespread malady it is possible to measure in a quantitative way, and with a high degree of accuracy, the extent to which the individual as well as the community is suffering. The measures of severity in general use, while scientifically accurate and dependable, involve difficulties of one sort or another in their practical application. In the research work carried on with the support of the Board, attention is therefore being given to developing tests of severity that are adapted for use under actual field conditions. It is less important, as has frequently been pointed out, to know that a person is infected than to know whether he harbors the parasite in such large numbers as to constitute a serious handicap to himself or a menace to others. Much of the work of a control campaign requires information as to the degree of severity of the disease and the conditions which may spread the infection in the community. Such information is of fundamental significance, for example, in deciding whether to adopt the mass treatment methods discussed in the preceding chapter or some other form of campaign.

Clinical Manifestations of Hookworm Disease. The most obvious guide to severity, and the first to be used in point of time, was the clinical manifestations of the disease in individual cases. Many of the symptoms are easily recognized and were well-known long before the fundamental facts as to the nature of the disease and the mode of infection were discovered. Until the technique of microscopic examination of stools was developed, primary diagnosis was based exclusively on the symptomatology of the disease. Much importance was attached to a complete description of the symptoms, not only as the means of diagnosis, but also as a measure of severity. In the pioneer work of the Commission for the Study and Treatment of Anemia in Porto Rico, for example, several grades of severity were recognized and for each grade the characteristic clinical symptoms elaborately described. In the simplest form of classification only three grades were recognized: *slight*, *moderate*, and *marked*. In certain studies cases were divided on the basis of symptoms

into, *very light, light, moderate, severe,* and *very severe* forms. Still more elaborate classifications based on the intensity of the disease were attempted, but without results of practical value. For purpose of routine treatment microscopic examination of stools for ova soon supplanted clinical diagnosis. Similarly, more exact and reliable measures of the intensity of infection have been substituted for clinical observation.

HEMOGLOBIN INDEX

Anemia the Most Characteristic Symptom of Hookworm Disease. In the symptomatology of hookworm disease anemia has always been a prominent feature. From the earliest times a mysterious anemia of unknown origin, but certainly in many cases caused by hookworm infection, has been observed. The violent epidemic of "miner's anemia" which broke out among the workers during the construction of the Saint Gotthard Tunnel in 1880 first arrested the attention of modern science and led to the discovery that "miner's anemia" the world over was due to hookworm disease. Taking its name from its most prominent symptom, in one place the disease was "miner's anemia," in another "brickmaker's anemia," while in the Southern States it was "cotton-mill anemia." The commission created by Porto Rico in 1904 for the study and treatment of hookworm disease was known as "The Commission for the Study and Treatment of Anemia."

Hemoglobin Index as a Measure of Severity. The ease and relative accuracy with which all grades of anemia can be measured by hemoglobin readings naturally lead to the use of the hemoglobin test as a measure of the severity of hookworm disease. Observations of the blood of persons suffering from the disease were made as early as 1892 when Zappert reported a moderate grade of anemia with a low color index. The Porto Rican Commission from 1904 to 1907 made much use of the hemoglobin index as the best guide to the severity of the disease before and after treatment, although it was pointed out that the number of parasites harbored and the hemoglobin did not seem to bear a constant relation to each other. Boycott, in 1907, on the basis of work done in English tin mines stated that anemia in hookworm disease is generally in proportion to the number of worms present, but warned against marked exceptions to this rule. Dock and Bass and many other writers on hookworm disease have substantially repeated this opinion, although recognizing that anemia is influenced by individual susceptibility and capacity of blood regeneration. According to the present view, held by Dr. Darling and others, there is a direct causal relation between the number of worms found and the degree of anemia, although this relationship does not necessarily hold in every individual case. An infected individual may maintain a normal hemoglobin value for a time, the first twenty-five or fifty hookworms seldom being sufficient to break down the resistance to anemia, but with an increasing number of parasites a point is eventually reached at which compensation breaks down and the hemoglobin index

declines suddenly and rapidly. Moreover, in youth and early adult life hemoglobin corresponds but poorly with the number of worms harbored, as was shown by Smillie's Brazilian cases, the reason being that the resistance and recuperative powers of these groups are higher than in the elderly or in very young children. In short, while hemoglobin is not a reliable index of the number of worms harbored, it is one of the best indexes of the amount of actual injury which hookworms produce in any individual case, provided other anemia-producing factors are not present.

Hemoglobin Determinations in the Work of the International Health Board. In the original system of records adopted by the International Health Board for reporting on work for the control of hookworm disease in various countries, two of the six points considered of primary importance were: (1) the degree of severity as shown by the hemoglobin index of persons found infected; (2) the effect of treatment in improving health, to be shown by comparing the hemoglobin index before treatment with the index six months or more after the treatment. Hemoglobin determinations were not required for every individual case, discretion being left to the field director as to when the tests were feasible or desirable. The results of these tests have been reported from time to time in the annual reports of the Board.

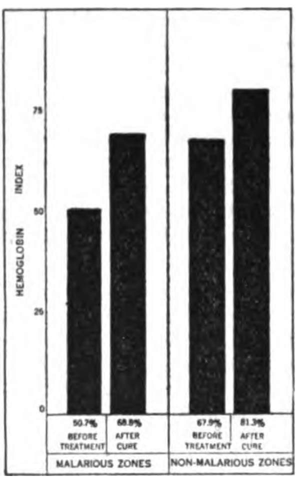


Fig. 53.—Average hemoglobin index of 2,605 cases of hookworm disease in Costa Rica before treatment and after cure

Hemoglobin Index in Costa Rica. Hemoglobin determinations before and after treatment were made a part of the routine procedure of the hookworm campaign in Costa Rica, covering the period from January 1, 1915, to May 29, 1921, and including most of the rural population of the country. An analysis was made by Dr. Schapiro in 1922 of all the cured cases for which records were available for the same individual before and after treatment. These cases, numbering 2,605, were representative of the total population as to sex, age, occupation, and social status. The average hemoglobin index for this group of infected persons before treatment was 64.5, almost 60 per cent of the cases showing less than 69. The hemoglobin is normally some 20 points lower in tropical than in temperate zones. Dr. Schapiro found that for the population of Costa Rica it ranged around 80 per cent. The average hemoglobin deficiency of the infected population was

therefore 15.5 per cent. In non-malarious zones, however, the index was 67.9, or an average loss of 12.1 attributable to hookworm alone. In the malarious zones the average was 50.7, or a total hemoglobin deficiency of 29.3 per cent, of which it may be inferred that malaria accounted for 17.2 per cent, or more than one half.

After the cases were treated until no longer positive by microscopic examination, the hemoglobin rose to an average of 78.7 per cent. Improvement was found to be less in male than in female patients, and among children under five greater improvement occurred than any other age group.

WORM COUNTS

Worm Count a More Accurate Test of Severity than Hemoglobin. While it may be concluded that in general and on the average there is a high degree of correlation between the hemoglobin index and the number of worms harbored, exceptions are so numerous and important in individual cases that many workers have come to prefer to rely on worm counts alone for the information desired in regard to the severity of hookworm disease. Knowledge of the actual number of worms present in the individual case, and the average number for the community, seems to be more important for the health officer than a detailed description of symptoms or complete hemoglobin index. Individual resistance to the ravages of the parasite varies, but on the whole the number of worms harbored is a better guide to the extent of the problem than the hemoglobin reading, which is influenced by many other factors. The worm count has been used for different purposes for a considerable period, but the starting point in its use as a method of measuring the severity of hookworm disease before and after treatment was the work of the Uncinariasis Commission to the Orient, 1915–1917 (Drs. S. T. Darling, M. A. Barber, and H. P. Hacker), which brought together most of the data on which the present-day technique has been built up.

Worm Counts for Testing the Efficiency of Anthelmintics. The Porto Rico Anemia Commission made use of worm counts as early as 1905 to test the efficiency of the different anthelmintics in use, as well as to compare the grades of anemia with the number of worms harbored. The Uncinariasis Commission to the Orient, Caius and Mhaskar in Madras, Flu, de Langen, and Weehuizen of the Dutch East Indies Civil Medical Service, and Smillie in São Paulo, have made extensive use of the worm-count method in studying the properties of various drugs used for anthelmintic purposes. In any investigation of the anthelmintic properties of drugs, dosages, or methods of administering the drugs, the worm count has come to be considered indispensable. For such purposes the results are usually stated in the form of the percentage of the total worms harbored that are removed by one or two treatments.

Severity of Disease Before Treatment. Although the studies that have been made seem to indicate that the worm count is slightly more accurate in disclosing infections than microscopic examination of

the feces for the presence of ova, it is not proposed to adopt the worm count as the standard method of diagnosis. In planning a treatment campaign, however, it is considered desirable to have information as to the degree of infection, which the mere presence of ova in the stool does not give, and which neither clinical observation nor the hemoglobin index furnish in a satisfactory way. "Heavily infected persons," says Dr. Darling, "and heavily infested soils should receive preferred attention. The grades of infection or the worm index of groups of individuals as influenced by age, sex, or by habits and environment, must be ascertained. This is readily obtainable by the method of worm counting. It is more humane to treat those wretched persons who are suffering from the more severe infections than the more lightly infected ones. Agriculturists, who are carrying a burden of 200 or 300 hookworms, demand our attention before the lightly infected townspeople and mountaineers and others, who may harbor no more than twenty-five worms."[1] The worm count has been used to some extent as a guide in determining the areas in need of urgent treatment campaigns in Australia, New Guinea, the Solomon Islands, Siam, and Brazil. In the Solomon Islands great disparity was found in the worm index of the different islands.

Worm Counts After Treatment. Perhaps the most important use of the worm count is to measure the results of a treatment campaign. Resurveys to determine the permanent effects of treatment have usually been based on the infection rate. The difference between the rate of infection before and after treatment, however, may give an entirely erroneous conception of what has actually been accomplished in the reduction of the disease. This was strikingly shown in tests made by Dr. Smillie of two communities in Brazil three or four years after the original treatment campaign. The *rate* of infection showed only a slight reduction, but comparison of the number of worms harbored showed that the amount of hookworm disease had declined 79 per cent in one community and 95 per cent in the other. Similar results might have been shown by other tests of severity. There is little question, however, that a comparison of the severity of the disease before and after treatment based on a reasonable number of worm counts is the most accurate method available for measuring the lasting results of a curative campaign in any community.

Other Uses of the Worm Count. In experiments conducted in Madras, Dr. Kendrick employed the worm-count method to determine rates of reinfection. Worm counts have also been used to a certain extent for determining the geographical, racial, or occupational relationships of individuals or groups. The species of hookworms harbored by a race or a community are determined by geographical, racial, and climatic conditions, and are limited, of course, to the species of larvae existing in the soil of their immediate environment. The "worm picture" may thus

[1] The Hookworm Index and Mass Treatment; by S. T. Darling. Reprinted from *The American Journal of Tropical Medicine*, September, 1922, v. 2, pp. 397–447.

disclose important information as to the previous environments and even as to the ethnical origin of peoples.

Lambert in the South Seas, and Gregg in Brazil, found the worm-count method to have educational and publicity value in conducting hookworm campaigns. Among ignorant natives the simple procedure of making a worm count, and the sight of a number of parasites that have been preying on their vitals seem to have a valuable psychological effect. The average layman looks upon the doctor who expels and counts worms as a thorough scientist. Consequently a few well-selected lavages in public are found to enhance the prestige of a campaign.

Technique of Worm Counts. The standard methods for making worm counts have been largely evolved by Darling and his co-workers, first in the Orient, then in Brazil. With instruction, native assistants or clerical workers can do much of the routine of washing and counting the stools. But it is always best for the director or other medical man to inspect and check up the work of the assistants. The technique is not difficult, but requires considerable experience in identifying the types and sexes.

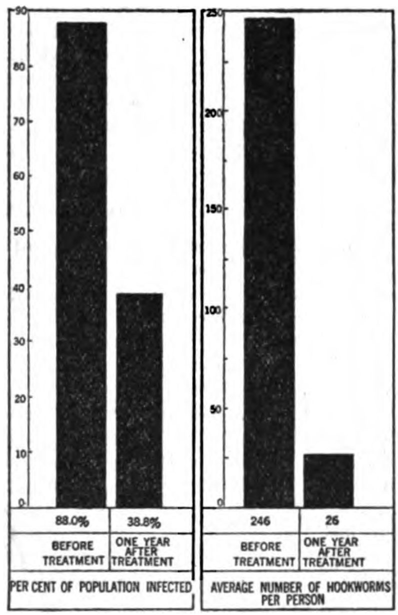


Fig. 54.—Decline in severity of hookworm disease in a rural area of Nicaragua. The *rate* of infection showed a much smaller reduction than the hookworm index, or average number of worms harbored as shown by worm counts

Disadvantages of the Worm-Count Method. Serious difficulties are encountered in the process of making worm counts—difficulties which have prevented the method from attaining its widest usefulness as a measure of severity. Persons on whom counts are to be made must be under good discipline, whether self-imposed or compulsory, and willing to co-operate. They must also have sufficient intelligence to carry out directions and be isolated from their fellows for at least forty-eight hours. In order to secure a typical worm index for a community, all ages, both sexes, and all stations of life should be represented in the group, and this is fre-

quently not possible. Children under eight years of age can seldom be used because of the vigorous character of the treatment and because of their lack of knowledge and discipline. The time and expense involved in making a worm count of a reasonably representative sample of the population of a large community is a serious drawback. An added difficulty is the time required of the patient. To keep a native coolie, barely above the subsistence level, away from his work for two days is ordinarily quite impracticable. The most satisfactory counts, apart from jails and hospitals, have been carried out on large estates or plantations in isolated communities where the colonists or coolies were under strict discipline and the owners have heartily co-operated. The Commission to the Orient found it necessary at times to pay the wages of the coolies for the period they were absent from work. As their wages were very small, amounting to a few cents a day in United States money, this was the cheapest means of getting the information desired.

OVA COUNTS

Efforts to Measure Intensity of Infection by Ova Counts. The practical difficulties which arise in the application of the worm-count method have recently led Dr. Cort and his co-workers to make experimental studies of the possibility of determining the intensity of infection by estimating the number of eggs in the stools. Attempts were made at least forty years ago to estimate the number of worms harbored by counting the eggs in a sample of feces. Parona, Grassi, and Lutz in the early eighties made varying estimates of the number of hookworms in the intestines that would produce a given number of eggs per centigram of feces. Leichtenstern (1886) reported, on the basis of several autopsies, that by dividing the number of eggs found in each gram of feces by the number of forty-seven the quotient would give the number of female worms. Baermann (1917) counted 1,141,600 viable eggs in the entire stool of a woman who was found on autopsy to harbor 1,986 worms, of which 1,102 were females, a ratio of about ten viable eggs per female per gram of feces.

In spite of the attention that has been given to the ova-count method, it has never been used extensively because it has not seemed possible to fix a definite ratio of eggs in a sample of feces to the worms harbored. The egg output apparently varies with the species and environmental conditions, as it obviously does with the sex ratio. The number of ova has been found to be diminished by alcohol or salty food in the patient's diet. Variations in the consistency and amount of the feces due to varying habits of diet have a marked effect on the eggs per worm, as Stoll has found.

Smillie's Experimental Work in Brazil. Dr. Smillie in 1921 made an experimental study of the possibility of estimating the number of worms harbored by counting the ova in a miscroscopic field. He selected 135 cases for ova counts, afterwards classifying them on the basis of number of eggs found in the stool. Forty cases gave negative microscopic

Fig. 55.—Waste irrigation water breeding myriads of mosquitoes. This is frequently the result of a faulty system of irrigation or careless methods of applying the water

Fig. 56.—A leaking flume—one of the ways in which irrigation causes man-made malaria

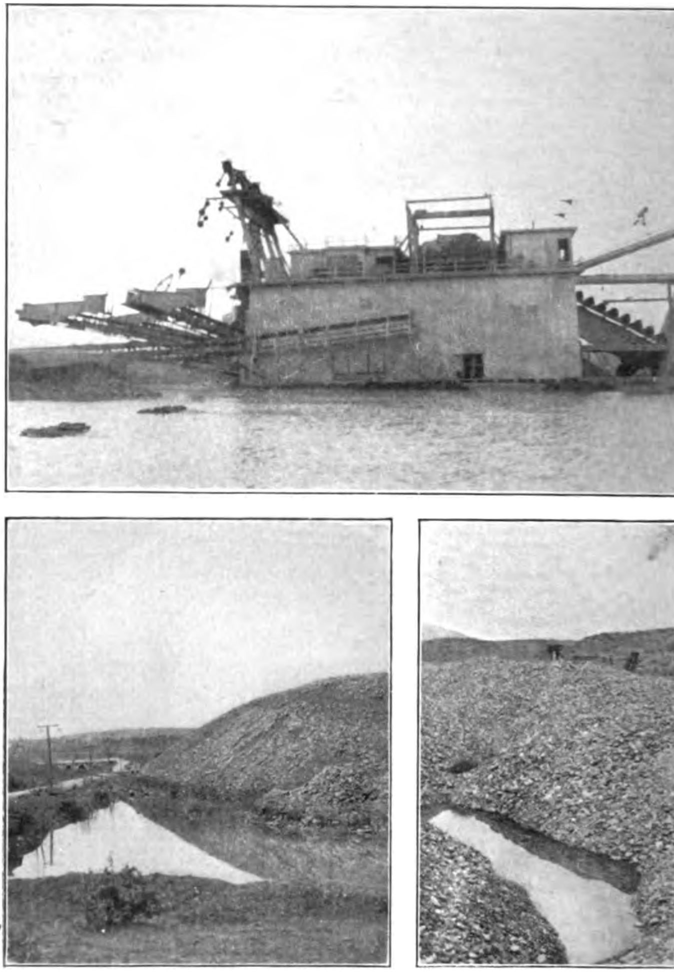


Fig. 57.—Gold-dredging operations are an important cause of man-made malaria. *Top:* gold dredger in operation in California; *Bottom:* ponds and tiny pools left by faulty methods of dredging become prolific mosquito breeding-places

results; in the others the ova ranged from *very rare* to *very abundant*. All cases were then given a test treatment and the expelled worms counted. Nineteen of the forty cases negative by the microscopic test yielded hookworms on treatment, with a total of 104 worms.

A definite relationship between the number of ova in the stools and the number of worms harbored appeared when general averages for the groups were employed, but in individual cases it was found that the ova count was not a reliable index of the number of worms in the intestines. One individual having very abundant ova harbored only twenty-three hookworms. Others having so few ova that they were found only after long and careful search harbored from 150 to 200 worms.

Stoll's "Dilution-Count" Method. Stoll, in the series of hookworm investigations carried on under the direction of Dr. Cort[1] by the Department of Medical Zoology of the Johns Hopkins University School of Hygiene and Public Health in co-operation with the International Health Board, after reviewing all previous efforts to discover a method of using ova counts developed a new technique which promises to put the egg-count method on a practical basis. The essential features of the dilution method are as follows: An accurately weighed quantity of feces is thoroughly mixed with a decinormal solution of sodium hydroxide. A quantity of the mixture is then placed on a slide and examined with the low power microscope and the eggs counted. The number of eggs found gives a basis for calculating the number of eggs per gram of feces. Employing this technique and using every precaution against error, Stoll examined the feces collected for one to four days from certain persons in the Utuado Municipal Hospital in Porto Rico where practically all patients are treated for hookworm disease as a matter of hospital routine. The eggs expelled ranged from 187,000 to 5,059,420 per patient per day. The worms harbored ranged from 37 to 1,163 (*Necator americanus*). Of the total of 4,704 worms expelled 51 per cent were females. The average egg output per day for each female worm, based on all cases, was approximately 9,000. Upon experimentation it was found that the number of eggs per gram of feces divided by the factor of forty-four approximated the number of female worms harbored. To calculate the total number of worms harbored it is necessary to discover the sex ratio for the given environment, unless one arbitrarily assumes an equality of numbers between the male and female parasites. Stoll's method gives only the number of eggs per producing female worm harbored. It makes no allowance for very young or non-egg-laying parasites which, according to Dock and Bass, form approximately 7 per cent of the females. Its par-

[1] On the Relation between the Number of Eggs Found in Human Feces and the Number of Hookworms in the Host; by N. R. Stoll. Reprinted from *The American Journal of Hygiene*, March, 1923, v. 3, pp. 156–179.
On the Use of an Egg-Counting Method in Soil Culture Studies of Hookworm Larvae (Preliminary Report); by N. R. Stoll. Reprinted from *The American Journal of Hygiene*, May, 1923, v. 3, pp. 339–342.
Human Infestation Studies in Porto Rico by the Egg-Counting Method; by G. C. Payne, W. W. Cort, and W. A. Riley. Reprinted from *The American Journal of Hygiene*, May, 1923, v. 3, pp. 315–338.

ticular virtue lies in the regularity of results. All previous methods of egg counting used the direct smear, only a few milligrams being placed on the slide, or flotation, which gives a greater concentration of eggs in the smear than in the average of the sample. Both these methods obviously permit a serious lack of uniformity. The dilution method uses a larger original portion of the stool, thus insuring better sampling in case the eggs are not distributed evenly. From all the evidence he was able to obtain as to the accuracy of this method, Stoll believes that in routine practice it yields counts which on the average involve an error of less than 10 per cent of the absolute number of eggs present.

Egg Counts in an Intensive Campaign in Porto Rico. For a period of three months in 1922 the ova count was tried out by Dr. Rolla B. Hill[1] under field conditions in Hatillo, Porto Rico, under the joint auspices of the Department of Health of Porto Rico and the International Health Board. The results obtained seem to indicate that ova counts based on the Stoll technique, and using only native microscopists, will give more information as to the degree of infection than can be secured in any other way. The most obvious advantage of the ova count is the fact that it is not necessary for the patient to be subjected to controlled conditions. It can also be used with comparatively slight expense, since it is possible to carry it on rapidly by the regular staff of a hookworm field unit without detriment to the campaign. Dr. Hill's experiments even suggest substituting the ova count for microscopic diagnosis, at least in preliminary surveys. In first examinations he found that the egg count gave the same per cent of positives as the centrifuge, when dealing with relatively heavy infections. In the lighter infections, and in examinations after treatment, both methods missed a considerable number of positives. Further experimental work will be necessary to determine whether the ova count can be successfully used as the sole method of examination in a preliminary survey. It may also be found that variations are too great to allow the conversion of egg output into a worm index which can be relied upon as an accurate measure of the severity of infection. Nevertheless the egg output, in the opinion of Dr. Cort and his assistants, will remain the best guide to the concentration of infective material or the potential sources of heavy soil infestation.

[1] The Use of the Egg-Counting Method in an Intensive Campaign; by R. B. Hill. Reprinted from *The American Journal of Hygiene*, July supplement, 1923, v. 3, pp. 37–60.

IV

PROGRAMS OF MALARIA CONTROL

The immediate object in view when the International Health Board began its co-operative malaria work in 1916 was to discover practical methods of control which the average community could afford. Efforts to control malaria up to that time had been carried through almost without regard to cost for the sake of some military or commercial end. Field experiments were therefore undertaken in selected communities to demonstrate and thoroughly test and evaluate separately a number of control methods, particularly antimosquito measures, the screening of houses, and cure of human carriers by means of quinine. No attempt was made in the beginning to put into operation a comprehensive malaria program, although it was anticipated that the demonstrations would eventually lead to county and state programs in which all the successful control measures would be combined with varying emphasis to meet local conditions. General programs of this kind are now developing rapidly. The experimental demonstrations have been repeated in an increasingly large number of communities, which have in most cases taken over the work and assumed the expense. Special divisions of the state health organization have been created to stimulate and aid the control operations carried on by local health authorities in Arkansas,

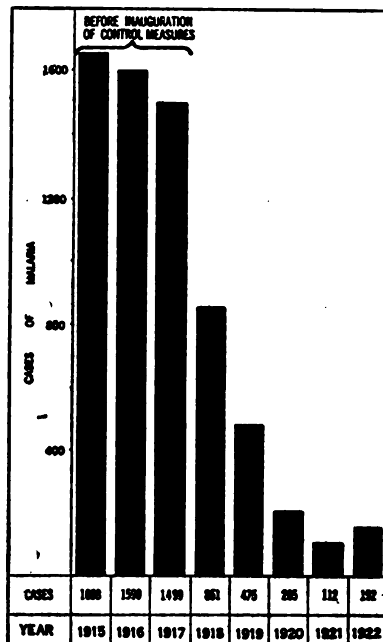


Fig. 58.—Results of malaria control measures in Harrison County, Mississippi, supported by state and federal health organizations

Alabama, Georgia, Illinois, Mississippi, North Carolina, South Carolina, Texas, and Virginia.

County-wide Demonstrations in Malaria Control. For experiment in the use of separate methods of control the most practicable unit was the town, which could be selected with special reference to the method to be demonstrated. For general programs of control on a permanent basis, however, the county offers a convenient unit of operations, provided it has a full-time health organization. When the malaria control demonstrations began in 1916 only twelve full-time county health units were in operation; at the close of 1922 there were 214. The success of the town demonstrations and the development of county health units have made it possible for the Board to transfer its participation from the town to the county-wide demonstrations, which it is doing as rapidly as practicable. In 1922 aid was given to thirty-four county-wide programs.

Through the town demonstrations the practicability of a variety of control measures has been thoroughly established. The need is now to extend the work as rapidly as possible to towns and rural districts on a county-wide basis. Anti-malaria work in rural communities of wide area and sparse population presents difficulties and problems not met with in towns. It has become increasingly clear that continuity and permanence of the work in the towns and rural districts can best be accomplished by county health departments.

County-wide Malaria Program. During 1922 general programs of malaria control with the county as the administrative unit were inaugurated in Mississippi, Alabama, and Virginia.

The Mississippi program in detail for urban communities consisted of: (1) *Antimosquito work*, including (a) major and minor drainage, (b) brushing and clearing of streams, (c) filling, (d) oiling, (e) fish control, (f) prevention of man-made mosquito breeding-places; (2) *General publicity*, secured by the distribution of literature, the posting of placards in public places, and the co-operation of local newspapers and civic organizations; (3) *Education*, through public and school lectures, demonstration exhibits in schools and colleges, and motion pictures; (4) *Quinine distribution*, aiming to make the standard treatment available in every community, urging its use by placards, and soliciting the co-operation of physicians and druggists; (5) *Compiling statistics* based on (a) malaria surveys, (b) physicians' records, (c) prescription records, and (d) health officers' records.

In rural communities the Mississippi program was confined to: (1) Instructions for proper screening, advocating 16-mesh screens and persuading dealers to handle no other; (2) Instruction in the use of standard quinine treatment and making it available; (3) Instruction in fish control, establishing and maintaining hatcheries and distributing fish under direction of the schools; (4) Co-operation with engineers in an effort to promote general agricultural drainage and to forestall the creation of artificial breeding-places along levees, public highways, railroads, and other

Fig. 59.—Phases of malaria control. *Top:* a ditch within a ditch to maintain a current even with a small volume of water; *Lower left:* one of the drainage ditches constructed in the Mobile, Alabama, demonstration which has been called the best piece of mosquito control work in the South. Sloping sides and round bottom are clearly revealed by the shadow cast across the ditch in the background; *Lower right:* sign erected by the Brewton (Alabama) Chamber of Commerce

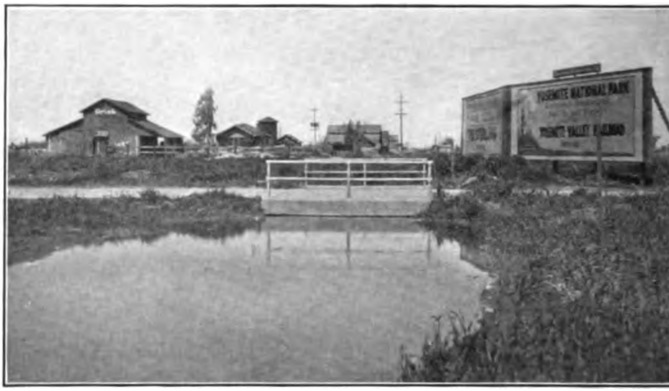


Fig. 60.—Inadequate drainage provided in the construction of a state highway

Fig. 61.—An undrained borrow pit along an improved state highway furnishes an ideal breeding-place for the malaria mosquito. Breeding-places of this kind can usually be prevented if the danger to public health is brought to the attention of highway authorities

public works; and (5) General publicity and education, through illustrated lectures, exhibits, demonstrations, literature, and newspaper articles.

In Alabama county-wide programs in eighteen counties placed special emphasis on the instruction of county health officers, in the identification of species of mosquitoes, methods of drainage, oiling, the use of fish and larvicides, the approved methods of screening, and the principles of quinine administration. Surveys are made by the county health officer and the sanitary engineer of the state health department. All work undertaken in a county is under the direction and supervision of the county health officer, the state malaria engineer acting as his assistant and adviser and checking the work of the local sanitary inspector. The program of education and general publicity work, also under the direction of the county health officer, is similar in scope and method to that followed in other states. In the rural districts the county health officer's function, as in Mississippi, is necessarily confined mainly to educational and advisory relations, special effort being made to promote the organization of drainage projects with malaria control as one of the objects in view. Responsibility for the prevention of man-made Anopheles breeding-places is divided between the state health officer, who endeavors to secure the co-operation of the railroads and the state highway department, and the county health officer who works through the local highway officials and the farmers and manufacturers.

Man-made Malaria. In all the general programs of malaria control the prevention of so-called man-made malaria or man-made breeding-places for Anopheles has received special emphasis. A surprisingly large proportion of the mosquito breeding in malarious districts can be prevented by the simple and obvious expedient of forestalling the creation of artificial breeding-places. Dr. Henry R. Carter estimates that 60 per cent, and in some places as much as 75 per cent, of the malaria is due to man-made breeding-places.

Railroads have been offenders, mainly by leaving borrow pits and interfering with natural drainage. In many cases highway construction has involved the same practices. By the use of improper methods agricultural drainage projects have often created much malaria. The impounding of water for power or other industrial purposes is a prolific source of man-made malaria. Improperly constructed street gutters, leaky hydrants and water-mains, artesian wells, overflowing cesspools, abandoned wells, fire protection water barrels, water troughs, all contribute to the easily preventable Anopheles breeding.

In California a serious malaria problem has been caused by faulty methods of irrigation and gold dredging. Improved methods of dredging are now in general use, but a typical dredge of the old type overturned the gently sloping or level ground of the river valleys leaving behind prolific mosquito breeding-places. The operation of an irrigation system, particularly where the water-supply is plentiful also causes much malaria. Seepage from the canals, often creating marshes a mile or more away, is one of the most serious problems. The excessive use of water, leaky

turnouts, flumes and dams, and improperly located spillways all result in prolific mosquito breeding-places. As these conditions are the result of carelessness in most instances they are easily remedied by educational measures.

The prevention of man-made malaria is chiefly a problem of education and co-operation under the leadership of the county health officer. Some states have enacted laws applying to railroad, drainage, and highway work, but voluntary co-operation on the part of corporations and highway officials brought about by health officials responsible for malaria control is the method being generally adopted. It is particularly important to secure the co-operation of corporation and public officials because if they create and permit artificial breeding-places on a large scale, the health officers can make little headway in persuading individual property owners to exercise great care in avoiding the creation of breeding-places.

Paris Green as a Larvicide. During 1921 it was discovered by Dr. M. A. Barber of the United States Public Health Service that Paris green serves as a most effective and inexpensive larvicide for the Anopheles mosquito. Dr. Barber and his associates used it in many places with great success during 1922. A mixture of approximately one part of the poison and one hundred parts of road dust, or any fine dust, is thrown into the air by hand so that the wind will carry the dust over the water to be treated. The very small amount of the poison necessary to kill the larvae is not dangerous to live stock or to the person distributing it. The Paris green kills only the Anopheles mosquito in the larval stage; it does not destroy the pupae, nor does it prevent the laying of eggs on the water as is the case with oil. It cannot be relied upon therefore where Culex must be controlled, but its economy commends its use against Anopheles. In Brewton, Alabama, a large pond was successfully controlled for the entire season at a cost of about $5. Effective fish control of the same pond, it is claimed would have required as much as $100 to keep the banks free from vegetation so that the fish could attack the larvae.

Antimalaria versus Antimosquito Work. It has been found by malaria workers throughout the Southern States that it is difficult to carry on antimalaria work without broadening it into an antimosquito campaign. The primary object from the public health point of view is to eradicate or control only the Anopheles mosquitoes, for it is well known that no other mosquito is capable of transmitting the malaria parasite. In most communities, however, experience has seemed to show that for the present it is also advisable to control the annoying mosquitoes—the Culex and Stegomyia (*Aedes aegypti*)—in order to obtain public support for Anopheles prevention measures. "The average layman," writes one county health officer, "while willing to accept the mosquito-borne theory thinks you are splitting hairs too much in laying all the blame on one species of that family. As long as you have mosquitoes puncturing the hide of the average farmer you are going to do very little work in malaria control unless you go after the whole tribe." Freedom from the mosquito

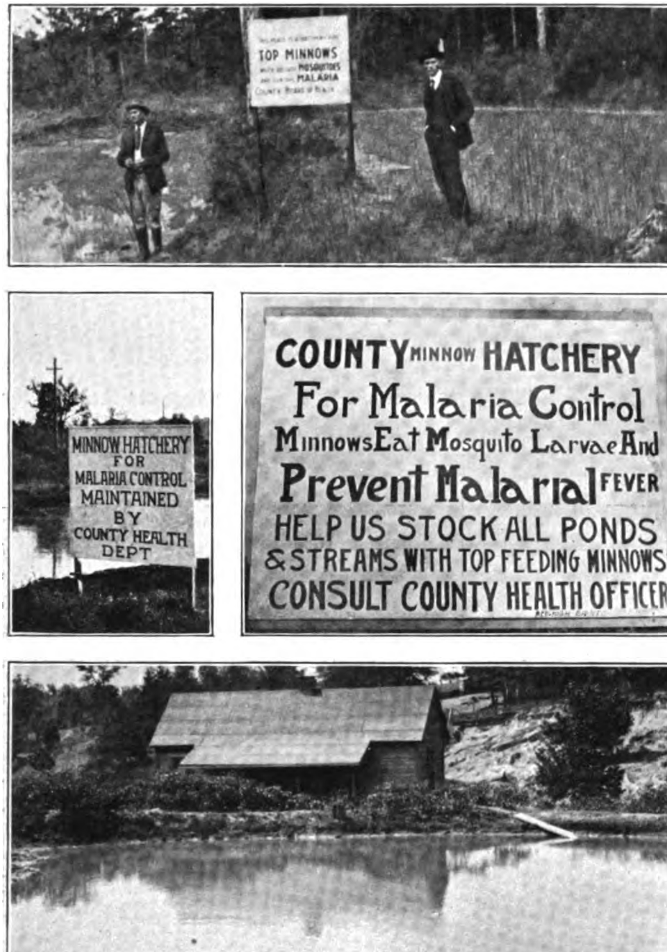


Fig. 62.—Minnow hatcheries maintained by county health departments now a common sight along the highways of many southern states. *Top:* in Houston County, Alabama; *Center right:* road signs like this appear in many parts of Texas; *Center left:* hatchery in Florence, Alabama; *Bottom:* top minnow hatchery in Yazoo County, Mississippi

Fig. 63.—A leaky hydrant may cause serious Anopheles breeding

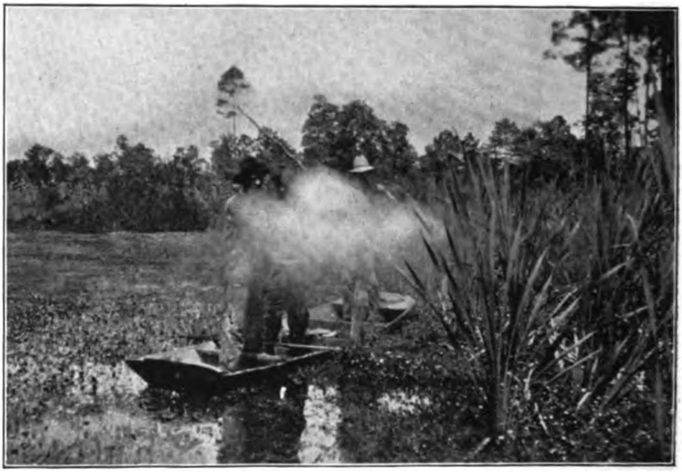
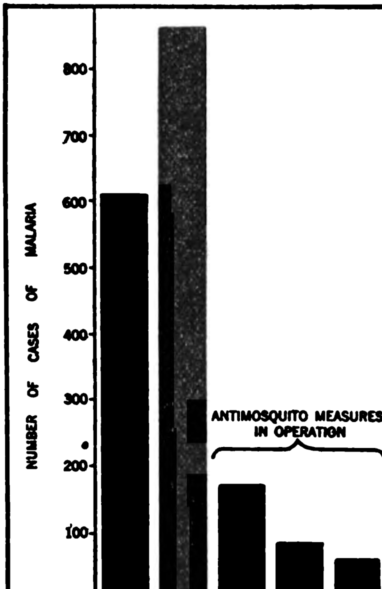


Fig. 64.—Using Paris green to kill the larvae of the malaria mosquito. It has recently been found by Dr. M. A. Barber, of the United States Public Health Service, that Paris green is an inexpensive and efficient means of controlling the malaria mosquito, especially useful in waters so choked with vegetation that fish cannot reach the larvae

nuisance makes a stronger appeal to the normal community than the elimination of malaria so that in general it has been found necessary to lay equal emphasis on control of Culex and Anopheles. Culex control in fact is often the more difficult, requiring in some towns 75 per cent or more of the money raised primarily for malaria control. Up to the present time the warfare against Culex mosquitoes has been justified on the ground that it makes the antimalaria work popular and insures a continuous appropriation. But Culex control is not, strictly speaking, a public health problem and with the development of county-wide malaria programs which are not altogether dependent on local sentiment the work may be confined to programs of Anopheles control.



CASES OF MALARIA	610	865	175	88	62
TOTAL COST	—	—	$1,617.41	$250.00	$700.00
PER CAPITA COST	—	—	34c	5c	15c
POPULATION PROTECTED	—	—	4700	4700	4700
YEAR	1918	1919	1920	1921	1922

Fig. 65.—The effect of antimosquito measures on the number of malaria cases in Jacksonville, Texas. This work has the enthusiastic support of the entire community

Dengue Fever in 1922. The case for general antimosquito control received some support in 1922 from the fact that dengue fever was epidemic in many parts of the South. This disease is transmitted by the Stegomyia mosquito, and perhaps by the Culex also, the former usually being classified outside of yellow fever territory as simply a nuisance mosquito. Towns practicing general mosquito control for the elimination of malaria enjoyed comparative freedom from dengue fever in 1922.

Screening Campaigns. An important feature of the county-wide and state-wide malaria programs is the attention given to proper screening. The intensive town demonstrations had shown that under certain conditions, and especially in extensive rural areas, control of mosquito breeding is not practicable with methods in use at present

except at prohibitive cost. When this is the case it is still possible to reduce the malaria rate by proper screening of houses. Malaria surveys have usually shown a very small proportion of houses properly constructed and screened to afford protection against the Anopheles mosquito. In one Mississippi county surveyed in 1922 only 44 per cent of the rural homes were well screened: 12 per cent were partly screened and 44 per cent not screened at all.

An effort is now being made throughout the South to encourage the use of screens where Anopheles breeding is not under control and to eliminate the use of all screens of less than sixteen meshes to the inch. The usual methods of education and general publicity—illustrated lectures, exhibitions, newspaper articles, pamphlets, etc. are being used to persuade the public to screen their homes and to buy only 16-mesh screening, and to induce the dealers to handle nothing else. By means of letters and personal conferences the state and county health departments have been successful in enlisting the co-operation of screen dealers over wide areas.

Extension of Fish Control. The value of the top minnow (*Gambusia affinis*) in the control of Anopheles breeding has now been thoroughly demonstrated in many towns throughout the South. Through the county-wide malaria programs fish control is being rapidly extended. During the year many counties have established hatcheries or largely increased the number already in use. The practice has developed of selecting for this purpose suitable ponds located not only at convenient distributing points, but also near the main highways. Conspicuous signs call the attention of the public to the supply of fish and urge the stocking of all ponds, streams, and other breeding-places. Each body of water stocked usually serves effectively as an additional hatchery. In some places it has been found necessary to use exhibits of Gambusia to instruct the public and especially fishermen to protect them. Boy scouts are often very effective in protecting the minnows and stocking numerous minor breeding-places.

Wider experience in the use of fish in malaria control has also served to acquaint health officers and the public with the limitations of the effectiveness of fish. Though a valuable ally, the Gambusia is usually helpless if left to accomplish the task alone. Under most conditions it is necessary to keep down vegetation by cutting or by other means, so that the larvae will not be protected from the fish by barriers which the fish cannot easily penetrate. It has been found necessary also to eliminate the fine floatage such as sawdust, because the larvae escape detection among the small particles of inert matter.

STATISTICAL TABLES

NOTES ON TABLE I

1. Table 1 on the following pages presents a concise statistical summary—by the main geographical divisions of the work, by states and countries, and by years—of the persons examined and treated in the world-wide campaign for the relief and control of hookworm disease aided by the International Health Board. It shows that in the thirteen years from 1910 to 1922, inclusive, a total of 4,016,646 persons have been examined in thirty-seven[1] different states and countries, of whom 2,257,061, or 56.2 per cent, were found infected. Of those infected, 2,724,214, were given at least one treatment; while 1,778,350, or 65.3 per cent, received two or more treatments.

2. Differences between figures which appear in this report and in the 1921 and earlier reports arise (1) from the fact that Table 1 must be prepared for publication each year before final statistical data are received from all areas, and (2) from the further fact that in areas where mass treatment has been followed in previous years the number of persons examined and found infected was estimated on the basis of the findings for those actually examined in preliminary surveys. In the following table the figures represent only those actually examined. It follows, therefore, that for some countries the number of persons treated is in excess of the number of those examined and found infected.

3. Two treatments of a standard remedy remove, on the average, from 88 to 95 per cent of the worms harbored, depending upon the drug used and the method of administration; and it is seldom that they leave more than ten worms in the intestine. Thus, though some persons may remain lightly infected after two treatments, this number is nevertheless adequate to establish what may be termed a "practical" cure. One treatment, similarly, removes from 75 to 90 per cent of the worms.

4. Though the figures have been itemized by states and countries and by years, this has not been done primarily to invite comparison of the results for one state with those for another, or of one year's work with that of another. Too many variable factors affect the results for such comparisons to be entirely valid. For instance, among other reasons, the variations or fluctuations may be due to the density of population or severity of infection in the areas of operation, to size of working staff, or to differences in the plan of work pursued. In other instances, as in British Guiana in 1919 and Dutch Guiana in 1921, the figures may represent results for only a few months instead of a complete year.

[1] See footnote 3, page 225.

5. The table includes the results of the early dispensary effort aided by the Rockefeller Sanitary Commission in the Southern States. These figures are not itemized by years, but are reported, under the respective states, as the total for the years 1910 to 1914, inclusive. Some of the work for 1914, separately indicated, was aided by the International Health Board. Since 1915, when work by the dispensary plan ceased in these states, the chief effort against hookworm disease has been directed toward the building and use of latrines. Therefore the aggregate figures for examination and treatment are not so large as in previous years, nor do they represent in all cases such thoroughgoing effort in the curative phase of the work.

6. In a number of countries operations were suspended during the war and resumed after its close; in others there have been temporary periods of suspension due to industrial depression, lack of trained directors, or similar causes.

7. Only the results of campaigns aided directly by the International Health Board or Rockefeller Sanitary Commission are included. In a number of countries, as in Brazil, government or voluntary agencies are conducting extensive independent campaigns against the disease, the results of which, if they could be included, would substantially increase the aggregate examinations and treatments.

TABLE 1: *Persons Examined and Treated for Hookworm Disease, 1910 to 1922, inclusive, in World-Wide Campaign Aided by International Health Board. Figures by main geographical divisions of work, by states and countries, and by years*

Division, Country, and State	Persons Examined	Persons Found Infected		Persons Given at Least One Treatment	Persons Given Two or More Treatments	
		Number	Per Cent		Number	Per Cent[1]
ALL COUNTRIES						
All Years	4,016,646	2,257,061	56.2	2,724,214	1,778,350	65.3
1910–1914	1,179,406	458,606	38.9	441,408	213,488	48.4
1914	35,100	17,791	50.8	16,106	11,925	74.0
1915	162,835	93,480	57.4	86,242	60,340	70.0
1916	223,976	133,744	59.7	126,834	93,302	73.6
1917	295,103	183,949	62.3	168,429	137,563	81.7
1918	343,867	217,023	63.1	216,757	164,815	76.0
1919	295,883	175,440	59.4	238,352	199,115	83.5
1920	357,289	208,639	58.4	300,632	241,572	87.0
1921	497,015	315,601	63.5	447,980	230,361	51.4
1922	626,172	452,788	72.3	681,474	425,869	62.5
DIVISIONS						
SOUTHERN STATES						
All Years	1,413,000	518,668	36.7	498,333	239,921	49.0
1910–1914	1,179,406	458,606	38.9	441,408	213,488	48.4
1914	9,211	2,434	26.4	2,264	653	28.8
1915	18,145	3,961	21.8	3,779	931	24.6
1916	22,169	4,569	20.6	4,544	2,939	64.7
1917	37,299	7,834	21.0	7,596	6,293	82.8
1918	44,241	8,074	18.3	7,636	4,681	61.3
1919	26,282	10,266	39.1	9,391	6,689	71.2
1920	44,644	12,732	28.5	12,528	1,554	12.4
1921	31,603	10,192	32.3	9,187	2,693	29.3

West Indies						
All Years	382,292	246,486	64.5	228,428	207,453	90.8
1915	61,604	36,568	59.4	33,648	24,559	73.0
1916	62,642	36,582	58.4	33,077	28,811	87.1
1917	75,779	46,051	60.8	42,739	40,738	95.3
1918	31,314	23,636	75.5	22,057	20,604	93.4
1919	20,350	14,537	71.4	13,534	12,962	95.8
1920	28,890	16,067	55.6	15,274	14,395	94.2
1921	27,402	15,712	63.6	14,443	13,882	96.1
1922	74,311	57,333	77.2	53,656	51,502	96.0
Central America						
All Years	1,156,589	715,387	61.9	633,338	470,178	74.2
1914	5,321	2,907	54.6	2,562	578	22.6
1915	83,086	52,951	63.7	48,815	34,850	72.0
1916	131,520	85,235	64.8	82,461	57,534	69.8
1917	127,652	77,585	60.8	71,809	47,204	65.7
1918	173,931	109,193	62.8	95,539	71,316	74.6
1919	175,201	98,857	56.4	86,079	70,061	81.4
1920	148,714	82,272	55.3	70,470	51,016	72.4
1921	138,222	85,444	61.8	71,796	55,634	77.5
1922	172,942	120,943	69.9	103,807	81,985	79.0
South America						
All Years	623,307	499,193	80.1	640,973	436,253	68.1
1918	10,490	6,922	66.0	5,894	4,208	71.4
1919	52,775	35,780	67.8	31,233	21,456	68.7
1920	98,956	73,286	75.6	73,901	61,276	82.9
1921	171,764	140,069	81.5	194,598	126,239	64.9
1922	289,322	243,136	84.0	335,347	223,074	66.5

TABLE 1—*Continued*

Division, Country, and State	Persons Examined	Persons Found Infected		Persons Given at Least One Treatment	Persons Given Two or More Treatments	
		Number	Per Cent		Number	Per Cent[1]
THE EAST						
All Years	441,458	277,327	62.8	723,142	424,545	58.7
1914	20,568	12,450	60.5	11,280	10,694	94.8
1916	7,645	7,358	96.3	6,752	4,018	59.5
1917	54,373	52,479	96.5	46,285	43,328	93.6
1918	83,891	69,198	82.5	85,631	64,006	74.7
1919	21,275	16,000	75.0	98,115	87,947	89.6
1920	36,085	24,282	67.3	128,459	113,331	88.2
1921	128,024	64,184	50.1	157,956	31,913	20.2
1922	89,597	31,376	35.0	188,664	69,308	36.7
SOUTHERN STATES						
Alabama						
All Years	86,995	48,852	56.2	48,114	13,372	27.8
1910–1914	74,473	43,718	58.7	43,520	9,857	22.6
1917[2]	564	47	8.3	47	42	89.3
1918[2]	675	79	11.7	79	79	100.0
1919	102	17	16.7	17	17	100.0
1920	4,574	1,335	29.2	1,334	1,227	92.0
1921	6,607	3,656	55.3	3,117	2,150	69.0
Arkansas						
All Years	48,483	8,866	18.3	6,705	1,614	24.1
1910–1914	47,983	8,863	18.5	6,702	1,614	24.1
1918[2]	500	3	.6	3		

Georgia						
All Years	75,341	46,058	61.1	45,552	14,497	31.8
1910–1914	73,518	45,564	62.0	45,095	14,521	32.2
1919	1,518	373	24.6	336	107	31.8
1920 [2]	305	121	39.7	121	121	100.0
Kentucky						
All Years	134,855	44,404	32.9	38,611	872	2.3
1910–1914	128,991	43,635	34.6	37,916	475	1.3
1915 [2]	1,833	460	25.1	460	316	68.7
1920	2,541	169	6.6	116	56	48.3
1921	1,490	140	9.4	119	25	21.0
Louisiana						
All Years	74,388	39,342	52.9	38,556	14,858	38.5
1910–1914	68,165	37,720	55.3	37,225	14,524	39.0
1914 [2]	2,568	879	34.2	876	324	37.0
1918 [2]	1,161	208	17.9	55		
1921	2,474	535	21.6	400	10	2.5
Mississippi						
All Years	280,757	109,809	39.1	108,323	74,496	68.8
1910–1914	184,944	75,813	41.0	74,598	58,687	78.7
1915	4,414	1,422	32.2	1,410	53	3.8
1916	3,780	1,466	38.8	1,455	1,182	81.2
1917	14,874	4,348	29.2	4,223	4,223	100.0
1918 [2]	8,468	4,084	48.2	4,069	3,541	87.0
1919	16,036	8,479	52.9	8,471	6,461	76.3
1920	31,198	9,730	31.3	9,730	42	.4
1921	17,043	4,467	26.2	4,377	307	7.0
North Carolina						
All Years	337,179	112,639	33.4	106,828	60,264	56.4
1910–1914	300,457	104,279	34.7	99,075	57,538	58.1
1914 [2]	4,837	1,429	29.5	1,321	294	22.3

TABLE 1—*Continued*

Division, Country, and State	Persons Examined	Persons Found Infected		Persons Given at Least One Treatment	Persons Given Two or More Treatments	
		Number	Per Cent		Number	Per Cent [1]
North Carolina—Cont'd						
1915 [2]	3,405	898	26.4	802	228	28.4
1917	9,048	2,057	22.7	1,984	1,149	57.9
1918	18,431	3,508	19.0	3,272	987	30.2
1920	728	238	32.7	142		
1921	273	235	86.1	232	68	29.3
South Carolina						
All Years	101,442	47,696	47.0	45,811	22,853	49.9
1910–1914	81,311	42,677	52.5	41,751	21,413	51.2
1914 [2]	840	90	10.7	31	4	12.9
1915 [2]	3,581	721	20.1	648	230	35.5
1916	6,665	1,991	29.9	1,980	1,206	60.9
1918 [2]	931	24	2.6			
1919	4,966	1,057	21.3	327		
1920	2,268	989	43.6	965		
1921	880	147	16.7	110		
Tennessee						
All Years	81,582	22,310	27.3	21,680	16,067	74.2
1910–1914	74,997	21,410	28.5	20,979	15,828	75.4
1915 [2]	1,172	116	9.9	116	20	17.2
1916	1,217	49	4.0	48	23	47.9
1917	856	129	15.1	126	71	56.3
1918	127	3	2.4	3	2	66.7
1919	378	17	4.5	9	3	33.3
1920	608	26	4.3	17	7	41.2
1921	2,227	560	25.1	382	133	34.8

Texas						
All Years	89,482	19,947	22.5	19,942	4,861	24.9
1910–1914	63,376	17,790	28.1	17,490	3,588	20.5
1916[2]	2,801	570	20.3	568	357	62.9
1917	7,084	1,058	14.9	1,021	662	64.8
1918	11,025	81	.7	70	51	72.9
1919	3,044	322	10.6	230	103	44.8
1920	2,115	123	5.8	112	100	89.3
1921	37	3	8.1	1		
Virginia						
All Years	102,516	18,745	18.3	18,660	16,394	87.9
1910–1914	81,191	17,137	21.1	17,057	15,941	93.5
1914[2]	966	36	3.7	36	31	86.1
1915[2]	3,740	344	9.2	343	84	24.5
1916	7,706	493	6.4	493	171	34.7
1917	4,873	195	4.0	195	146	74.9
1918	2,923	89	3.0	85	21	24.7
1919	238	1	.4	1		
1920[2]	307	1	.3	1	1	100.0
1921	572	449	78.5	449		
WEST INDIES						
Antigua						
Both Years	18,599	2,919	15.7	2,634	2,566	97.4
1916[2]	7,477	2,229	29.8	2,054	2,031	98.9
1917[2]	11,122	690	6.2	580	535	92.2
British Guiana						
All Years	71,322	44,073	61.8	39,906	35,494	88.9
1915	21,070	13,135	62.3	11,903	10,039	84.3
1916	18,498	9,808	53.0	8,263	6,225	75.3
1917	16,044	9,508	59.3	8,906	8,722	97.9
1918	11,719	8,727	74.5	8,175	7,900	96.6
1919[2]	3,991	2,895	72.5	2,659	2,508	94.3

TABLE 1—*Continued*

Division, Country, and State	Persons Examined	Persons Found Infected		Persons Given at Least One Treatment	Persons Given Two or More Treatments	
		Number	Per Cent		Number	Per Cent [1]
Dutch Guiana						
All Years	30,202	28,133	93.1	26,145	24,974	95.5
1916	4,411	3,900	88.4	3,667	3,414	93.1
1917	13,159	12,045	91.5	11,133	10,664	95.8
1921 [2]	924	817	88.4	744	714	96.0
1922	11,708	11,371	97.1	10,601	10,182	96.0
Grenada						
All Years	31,706	20,662	65.2	20,571	15,650	76.1
1915	18,584	11,194	60.2	11,522	8,064	70.0
1916	5,312	4,226	79.6	4,147	2,950	71.1
1917	7,810	5,242	67.1	4,902	4,636	94.6
Jamaica						
All Years	33,137	11,833	35.7	10,701	9,988	93.3
1919 [2]	2,842	1,552	54.6	1,346	1,291	95.9
1920 [2]	13,748	3,915	28.5	3,605	3,203	88.8
1921	9,807	3,085	31.5	2,754	2,635	95.7
1922 [2]	6,740	3,281	48.7	2,996	2,859	95.4
Porto Rico						
1922	22,413	18,504	82.6	17,223	16,957	98.5
Saint Lucia						
All Years	48,799	30,598	64.0	29,384	24,534	83.5
1915	7,924	4,436	56.0	4,106	2,177	53.0
1916	6,003	2,336	38.9	2,201	1,904	86.5
1917	4,601	3,060	66.5	2,962	2,658	89.6
1918	5,004	3,126	62.5	2,892	2,068	71.5

1919	4,350	2,597	59.7	2,547	2,364	92.8
1920	6,373	4,743	74.4	4,656	4,331	93.0
1921	3,181	2,274	71.5	2,225	2,164	97.3
1922	11,363	8,026	77.4	7,795	6,873	88.2
Saint Vincent						
All Years	**21,915**	**12,758**	**58.2**	**11,905**	**11,383**	**95.6**
1915 [2]	3,822	1,676	43.9	1,590	1,562	98.2
1916	7,494	4,062	54.2	3,748	3,653	97.5
1917	9,482	6,065	64.0	5,683	5,303	93.3
1918 [2]	1,117	955	85.5	884	865	97.8
Trinidad						
All Years	**104,199**	**77,006**	**73.9**	**66,959**	**66,007**	**98.6**
1915 [2]	10,204	6,127	60.0	4,527	2,717	60.0
1916	13,447	10,021	74.5	8,997	8,634	96.0
1917	13,561	9,441	69.6	8,573	8,225	95.9
1918	13,474	10,828	80.4	10,106	9,771	96.7
1919 [2]	9,167	7,493	81.7	6,982	6,799	97.4
1920	8,769	7,409	84.5	7,013	6,861	97.8
1921	13,490	9,536	70.7	8,720	8,369	96.0
1922	22,087	16,151	73.1	15,041	14,631	97.3
CENTRAL AMERICA						
Costa Rica						
All Years	**346,273**	**183,191**	**52.9**	**167,761**	**117,798**	**70.2**
1915	30,297	19,401	64.0	18,816	12,152	64.6
1916	40,579	22,608	55.7	22,037	9,899	44.9
1917	48,488	29,940	61.7	28,909	19,180	66.3
1918	56,371	29,898	53.0	27,487	19,154	69.7
1919	64,371	29,872	46.4	26,551	22,798	85.9
1920 [2]	36,342	10,743	29.6	9,006	6,415	71.2
1921	37,902	18,991	50.1	15,677	12,398	79.1
1922	31,923	21,738	68.1	19,278	15,802	82.0

TABLE 1—*Continued*

Division, Country, and State	Persons Examined	Persons Found Infected		Persons Given at Least One Treatment	Persons Given Two or More Treatments	
		Number	Per Cent		Number	Per Cent [1]
Guatemala						
All Years	231,756	150,050	64.7	133,171	119,126	89.5
1915 [2]	25,587	15,001	58.6	13,783	11,851	86.0
1916	39,596	26,665	67.3	25,961	23,618	91.0
1917 [2]	13,670	7,198	52.7	6,777	6,552	96.7
1918 [2]	32,861	22,299	67.9	19,950	19,057	95.5
1919	44,495	28,752	64.6	25,283	23,639	93.5
1920	21,469	12,805	58.7	11,429	10,402	91.0
1921	25,405	19,020	74.9	14,337	11,185	78.0
1922	28,673	18,310	63.9	15,651	12,822	81.9
Honduras						
1922 [2]	4,903	2,083	42.5	1,547	702	45.4
Nicaragua						
All Years	187,647	126,149	67.2	109,693	66,394	60.5
1915 [2]	2,192	1,659	75.7	1,298	18	1.4
1916 [2]	12,829	9,073	70.7	8,362	1,166	13.9
1917	33,781	18,422	54.5	16,950	5,652	33.3
1918	24,186	16,760	69.3	15,042	9,524	63.3
1919	12,246	5,820	47.5	4,829	2,146	44.4
1920	41,627	28,964	69.6	24,502	17,157	70.0
1921	23,183	16,312	70.4	13,940	11,265	80.8
1922	37,603	29,139	77.5	24,770	19,466	78.6
Panama						
All Years	145,722	116,507	80.0	104,415	78,328	75.0
1914 [2]	5,321	2,907	54.6	2,562	578	22.6
1915	25,010	16,890	67.5	14,918	10,829	72.6

1916	30,094	24,193	80.4	23,747	21,340	89.9
1917	16,676	14,088	84.5	13,262	11,126	83.9
1918	16,185	13,656	84.4	11,966	9,537	79.7
1919	15,307	13,490	88.1	11,812	8,313	70.4
1920	13,104	10,050	76.7	8,353	4,009	48.0
1921	5,932	5,014	84.5	4,595	3,151	68.6
1922	18,093	16,219	89.6	13,200	9,445	71.6
Salvador						
All Years	**240,288**	**137,407**	**57.2**	**116,751**	**87,830**	**75.2**
1916 [2]	8,422	2,696	32.0	2,354	1,511	64.2
1917	15,037	7,937	52.8	5,911	4,694	79.4
1918	44,328	26,580	60.0	21,094	14,044	66.6
1919	38,782	20,923	54.0	17,604	13,165	74.8
1920	36,172	19,710	54.5	17,180	13,033	75.9
1921	45,800	26,107	56.9	23,247	17,635	75.9
1922	51,747	33,454	64.6	29,361	23,748	97.9
SOUTH AMERICA						
Brazil [3]						
All Years	**508,448**	**393,182**	**77.3**	**538,009**	**348,393**	**63.8**
1918 [2]	10,490	6,922	66.0	5,894	4,208	71.4
1919	52,775	35,780	67.8	31,233	21,456	68.7
1920	92,093	67,243	72.2	68,207	56,923	83.5
1921	131,288	101,417	77.2	157,739	92,883	58.9
1922	221,802	181,820	82.0	274,936	172,923	62.9
Colombia						
All Years	**114,859**	**106,011**	**92.3**	**102,964**	**87,860**	**85.3**
1920 [2]	6,863	6,043	88.1	5,694	4,353	76.4
1921	40,476	38,652	95.5	36,859	33,356	90.5
1922	67,520	61,316	90.8	60,411	50,151	83.0

TABLE 1—*Continued*

Division, Country, and State	Persons Examined	Persons Found Infected		Persons Given at Least One Treatment	Persons Given Two or More Treatments	
		Number	Per Cent		Number	Per Cent [1]
THE EAST						
Australia [6]						
All Years	112,278	10,333	9.2	9,986	9,770	97.8
1920 [2]	5,008	350	7.0	345	345	100.0
1921	56,710	4,741	8.4	4,434	4,421	99.7
1922	50,560	5,242	10.4	5,207	5,004	96.1
Borneo						
Both Years	15,059	12,428	82.5	22,039	18,402	83.4
1921 [2]	5,325	4,556	85.6	10,568	9,951	94.2
1922	9,734	7,872	80.9	11,471	8,451	73.7
Ceylon						
All Years	117,034	105,658	90.3	413,173	350,540	84.8
1916 [2]	7,045	7,358	96.3	6,752	4,018	59.5
1917	42,828	41,613	97.2	35,675	33,440	93.7
1918	26,424	25,624	97.0	50,374	47,181	93.7
1919	15,542	11,852	77.5	88,602	84,712	95.6
1920	16,961	12,814	75.5	117,337	112,089	95.5
1921	497	422	84.9	20,958	16,533	78.9
1922	7,137	5,975	83.7	93,475	52,567	56.2
China						
Both Years	14,529	8,493	58.5	6,542	2,669	40.8
1918 [2]	12,504	7,556	60.4	5,694	2,519	44.2
1919 [2]	2,025	937	46.3	848	150	17.7

Egypt						
1914	20,568	12,450	59.7	11,280	10,694	85.9
Fiji						
All Years	11,041	8,534	77.3	50,220	5,754	11.5
1917 [2]	3,434	3,088	89.9	3,010	2,877	95.6
1918 [2]	3,190	2,887	80.5	2,770	2,674	96.5
1922 [2]	4,417	2,559	57.9	44,440	203	.5
Mauritius						
1922 [2]	12,643	5,279	41.8	3,680	3,083	83.8
Seychelles						
All Years	23,819	21,004	88.2	20,251	19,386	95.7
1917 [2]	8,111	7,778	95.9	7,600	7,011	92.3
1918	10,475	9,113	87.0	8,671	8,449	97.4
1919	3,708	3,211	86.6	3,127	3,085	98.6
1920 [2]	1,525	902	59.1	853	841	98.6
Siam						
All Years	114,487	93,148	81.4	185,971	4,247	2.3
1918	31,298	24,018	76.7	18,122	3,183	17.6
1919				5,538		
1920 [2]	12,591	10,216	81.1	9,924	56	.6
1921	65,492	54,465	83.2	121,996	1,008	.8
1922	5,106	4,449	87.1	30,391		

[1] Based on the total number of persons receiving at least one treatment.
[2] Represents part-year effort only.
[3] States of Brazil and Australia not indicated separately.

TABLE 2: *Expenditures of the International Health Board for the*

Activity, State, and Country	July 1, 1913–Dec. 31, 1915	1916	1917	1918
Grand Total	**$491,192.99**	**$506,087.48**	**$578,367.75**	**$1,121,862.86**
Relief and Control of Hookworm Disease.	327,794.87	306,574.04	369,988.49	457,953.94
County Health Work	....	....	182.95	2,494.53
Malaria Control	....	54,496.97	39,978.58	26,489.29
Yellow Fever Control	....	41,863.17	9,344.03	46,639.17
Tuberculosis in France............	....	....	51,856.24	433,030.43
Public Health Education.............	....	9,256.74	12,376.63	36,642.82
Public Health Administration...........	....	....	....	....
Public Health Laboratory Service.......	....	....	....	....
Philippine Hospital Ship...............	25,000.00	....	....	12,500.00
Investigation of Sewage Disposal at Rural Homes	....	664.39	5,359.11	4,288.01
Field Staff Salaries, Expenses, etc., not Prorated to Specific Budgets	25,229.15	4,687.45	9,232.30	5,345.82
Miscellaneous.......	30,196.00	27,628.35	18,191.76	23,034.17
Administration.......	82,972.97	60,916.37	61,857.66	73,444.68
Relief and Control of Hookworm Disease	**327,794.87**	**306,574.04**	**369,988.49**	**457,953.94**
United States *	89,565.64	47,565.09	53,446.11	87,284.58
West Indies........	91,101.16	88,845.12	87,764.12	57,800.06
Central America ...	74,932.01	88,123.29	98,483.25	113,545.86
South America	....	4,779.77	43,309.16	97,031.00
The East..........	56,719.85	77,260.77	84,912.45	97,932.47
Miscellaneous	15,576.21	....	2,073.40	4,359.97
United States:*	**89,565.64**	**47,565.09**	**53,446.11**	**87,284.58**
Alabama..........	4,343.33	....	1,235.97	5,922.09
Arkansas..........	....	....	2,462.59	2,784.41
Georgia...........	22,822.59	....	2,436.95	5,418.95
Kentucky.........	9,766.49	4,866.63	2,200.00	2,064.97
Louisiana.........	529.38	1,813.19	1,278.66	1,317.93
Mississippi........	11,719.14	8,786.77	9,223.36	9,427.52
North Carolina	3,026.99	3,282.34	8,548.71	15,775.89
South Carolina	5,872.56	5,643.52	7,967.22	13,870.12

* In September, 1917, the hookworm work in the Southern States began to be absorbed in the
being longer in some states than in others, it was not possible to announce until the end of 1920
regular functions, responsibility for all efforts directed toward the relief and control of hookworm

Years 1913 to 1922, Inclusive, Covering All Activities

1919	1920	1921	1922	Total
$1,436,355.00	**$1,658,572.61**	**$1,701,185.96**	**$1,864,988.44**	**$9,358,613.09**
509,091.99	621,520.98	457,486.99	497,300.23	3,547,711.53
2,439.25	8,182.77	167,765.19	205,701.78	386,766.47
34,965.08	133,929.02	150,551.39	155,938.84	596,349.17
94,526.42	139,757.40	239,057.53	209,981.99	781,169.71
602,775.78	518,013.51	359,540.31	268,274.49	2,233,490.76
38,367.71	68,373.54	89,094.44	173,332.39	427,444.27
....	....	....	77,917.73	77,917.73
....	....	16,109.70	26,304.39	42,414.09
6,500.00	....	....	....	44,000.00
778.60	....	....	....	11,090.11
21,701.87	26,074.89	38,936.95	61,605.65	192,814.08
46,901.63	51,248.30	59,652.90	17,719.15	274,572.26
78,306.67	91,472.20	122,990.56	170,911.80	742,872.91
509,091.99	**621,520.98**	**457,486.99**	**497,300.23**	**3,547,711.53**
110,860.17	136,019.06	15,730.39	7,510.26	547,981.30
48,457.24	61,857.73	85,541.60	110,039.59	631,406.62
111,684.19	98,303.98	77,920.73	86,960.59	749,953.90
157,555.86	206,486.22	150,422.24	168,548.81	828,133.06
80,014.39	113,472.55	121,805.46	116,734.95	748,852.89
520.14	5,381.44	6,066.57	7,506.03	41,383.76
110,860.17	**136,019.06**	**15,730.39**	....	**540,471.04**
5,283.74	17,256.71	....	....	34,041.84
....	....	....	....	5,247.00
4,604.21	4,525.39	....	....	39,808.09
1,978.40	16,599.03	....	....	37,475.52
1,370.18	....	....	....	6,309.34
15,773.21	20,709.72	....	....	75,639.72
13,924.04	10,463.00	....	....	55,020.97
14,754.86	17,210.63	....	....	65,318.91

programs of the rapidly developing county departments of health. The period of transition that in all the states the county health departments would henceforth assume as one of their and other soil-borne diseases.

TABLE 2: *Expenditures of the International Health Board for the*

Activity, State, and Country	July 1, 1913–Dec. 31, 1915	1916	1917	1918
Relief and Control of Hookworm Disease—*Continued*				
United States—*Cont'd*				
Tennessee	$11,889.72	$5,797.57	$6,585.02	$6,642.20
Texas	8,175.55	9,971.36	5,170.48	9,362.85
Virginia	6,622.97	7,403.71	6,337.15	5,947.86
Administration	....	....	....	8,749.79
County Dispensary Work in the South	4,796.92	....	....	....
Resurveys	....	....	....	....
West Indies:	**91,101.16**	**88,845.12**	**87,764.12**	**57,800.06**
Antigua	5,518.29	9,316.68	4,758.87	....
Barbados (survey)	....	1,651.31	....	....
British Guiana*	23,011.42	18,554.45	19,231.23	16,504.11
Cayman Islands (survey)	....	....	1,795.16	....
Dutch Guiana *	3,260.93	11,672.46	19,168.40	4,389.11
Grenada	17,597.13	10,154.65	7,778.80	1,833.74
Jamaica	....	....	....	3,937.85
Porto Rico	....	....	....	....
Santo Domingo (survey)	....	....	....	....
St. Lucia	10,791.06	6,295.20	6,865.60	8,152.28
St. Vincent	9,169.18	6,825.15	9,384.18	6,383.25
Tobago (survey)	....	....	1,072.22	....
Trinidad	17,376.86	15,104.04	10,898.37	12,301.48
Administration	4,376.29	9,271.18	6,811.29	4,298.24
Central America:	**74,932.01**	**88,123.29**	**98,483.25**	**113,545.86**
British Honduras (survey)	....	4,273.47	....	....
Costa Rica	26,087.66	18,089.98	21,752.31	21,330.40
Guatemala	10,618.22	11,954.29	13,346.70	20,816.27
Honduras	....	....	....	....
Nicaragua	7,962.80	18,430.69	19,418.74	22,454.30
Panama	28,645.96	24,449.62	22,881.75	24,312.26
Salvador	....	10,925.24	21,083.75	17,573.90
Administration	1,617.37	....	....	7,058.73
South America:	....	**4,779.77**	**43,309.16**	**97,031.00**
Brazil	....	4,779.77	43,309.16	97,031.00
Colombia	....	....	....	....

* For administrative reasons British and Dutch Guiana, although on the mainland of South

Years 1913 to 1922, Inclusive, Covering All Activities—Cont'd

1919	1920	1921	1922	Total
$10,201.59	$13,533.22	$........	$........	$54,649.32
22,380.20	14,723.99	....	....	69,784.43
10,012.42	14,965.17	....	....	51,289.28
10,577.32	6,032.20	....	....	25,359.31
....	....	....	....	4,796.92
....	....	15,730.39	7,510.26	23,240.65
48,457.24	**61,857.73**	**85,541.60**	**110,039.59**	**631,406.62**
....	....	....	2,552.67	22,146.51
....	....	....	....	1,651.31
9,984.28	486.37	1,281.02	248.37	89,301.25
....	....	....	....	1,795.16
613.23	570.34	12,917.66	17,786.64	70,378.77
....	....	....	....	37,364.32
9,832.48	18,400.09	16,949.24	23,241.56	72,361.22
....	7,823.35	18,290.86	28,450.98	54,565.19
....	1,077.07	....	....	1,077.07
8,109.32	11,444.57	8,545.88	9,378.80	69,582.71
....	....	....	....	31,761.76
....	....	....	....	1,072.22
15,293.43	16,016.71	17,489.50	17,590.83	122,071.22
4,624.50	6,039.23	10,067.44	10,789.74	56,277.91
111,684.19	**98,303.98**	**77,920.73**	**86,960.59**	**749,953.90**
....	....	....	....	4,273.47
20,492.01	20,219.60	14,061.66	6,355.05	148,388.67
19,514.73	17,126.43	15,362.58	18,467.99	127,207.21
....	....	....	10,736.24	10,736.24
26,164.44	18,745.12	21,479.43	15,894.48	150,550.00
18,565.05	20,061.02	23,496.22	18,675.03	181,086.91
17,162.10	14,973.80	3,520.84	8,283.79	93,523.42
9,785.86	7,178.01	....	8,548.01	34,187.98
157,555.86	**206,486.22**	**150,422.24**	**168,548.81**	**828,133.06**
155,430.38	193,560.95	131,787.27	146,852.50	772,751.03
2,125.48	12,925.27	18,634.97	21,696.31	55,382.03

America, are considered West Indian colonies.

TABLE 2: *Expenditures of the International Health Board for the*

Activity, State, and Country	July 1, 1913–Dec. 31, 1915	1916	1917	1918
Relief and Control of Hookworm Disease *Continued*				
The East:	$56,719.85	$77,260.77	$84,912.45	$97,932.47
Uncinariasis Commission to Orient	15,504.31	19,406.36	16,572.64	....
Australia..........	....	....	....	....
British North Borneo............	....	....	....	....
British Solomon Islands (survey)...	....	....	....	....
Ceylon...........	2,073.07	21,585.84	30,340.00	36,041.44
China............	....	....	3,981.58	12,400.87
Egypt............	26,074.78	....	....	....
Fiji..............	....	3,386.37	5,776.92	5,579.84
Java (survey)	....	327.66	....	....
India.............	....	....	....	....
Mauritius.........	....	....	....	....
Papua and Queensland............	....	....	4,074.84	18,633.50
Seychelles Islands..	589.06	3,933.29	7,409.69	8,089.06
Siam.............	....	6,147.52	6,458.57	13,042.15
Administration	12,748.63	22,473.73	10,298.21	4,145.61
Miscellaneous:	15,476.21	....	2,073.40	4,359.97
Field Research	....	....	....	....
Research in Life History of Hookworm Eggs and Larvae.........	....	....	....	....
Study of Methods of Diagnosing Hookworm Disease ...	....	....	....	....
Conferences, Health Officers of Southern States.......	....	....	2,073.40	2,990.76
Motion Picture Film on Hookworm Disease........	....	....	....	....
Lecture Charts	....	....	....	17.40
Salvador, Portable House and Office	....	....	....	945.35
Salvador, Loss from Earthquake.....	....	....	....	406.46
Thymol..........	15,476.21	....	....	....
Dutch Guiana, Care and Storage of Motor Boat and Supplies........	....	....	....	....

* Reports incomplete.

Years 1913 to 1922, Inclusive, Covering All Activities—Cont'd

1919	1920	1921	1922	Total
$80,014.39	$113,472.55	$121,805.46	$116,734.95	$748,852.89
....	....	....	....	51,483.31
15,902.95	35,417.41	39,912.29	35,375.57	126,608.22
....	3,106.23	7,440.10	*5,657.41	16,203.74
....	....	1,378.85	225.60	1,604.45
32,497.87	33,779.28	23,689.34	15,041.57	195,048.41
12,187.58	....	....	....	28,570.03
....	....	....	....	26,074.28
....	....	498.64	10,053.55	25,895.32
....	....	....	....	327.66
....	7,810.00	12,496.30	9,883.53	30,189.83
....	5,688.56	....	7,356.43	13,044.99
....	....	....	....	22,708.34
8,291.90	4,643.03	....	....	32,956.03
7,514.66	15,850.03	18,429.18	23,993.28	91,435.39
3,619.43	7,178.01	17,960.76	8,548.01	86,702.39
520.14	5,381.44	6,066.57	7,506.03	41,383.76
....	....	....	1,006.35	1,006.35
....	....	3,618.83	5,714.61	9,333.44
43.95	....	500.00	758.57	1,302.52
....	2,488.71	....	....	7,552.87
....	2,817.73	1,584.74	....	4,402.47
....	....	....	....	17.40
476.19	75.00	....	26.50	1,523.04
....	....	....	....	406.46
....	....	....	....	15,476.21
....	....	363.00	....	363.00

TABLE 2: *Expenditures of the International Health Board for the*

Activity, State, and Country	July 1, 1913–Dec. 31, 1915	1916	1917	1918
County Health Work *	$........	$........	$182.95	$2,494.53
United States:				
Alabama	....	....	....	....
California	....	....	....	....
Florida	....	....	....	....
Georgia	....	....	....	....
Illinois	....	....	....	....
Indiana	....	....	....	....
Iowa	....	....	....	....
Kansas	....	....	....	....
Kentucky	....	....	....	....
Louisiana	....	....	....	....
Maryland	....	....	182.95	2,494.53
Mississippi	....	....	....	....
Missouri	....	....	....	....
New Mexico	....	....	....	....
North Carolina	....	....	....	....
Oregon	....	....	....	....
South Carolina	....	....	....	....
Tennessee	....	....	....	....
Texas	....	....	....	....
Virginia	....	....	....	....
West Virginia	....	....	....	....
Administration	....	....	....	....
South America:				
Brazil	....	....	....	....
Malaria Control	....	54,496.97	39,978.58	26,489.29
United States:				
Alabama	....	....	....	....
Arkansas	....	11,104.58	4,276.23	4,749.02
California	....	....	....	....
Georgia	....	....	....	....
Illinois	....	....	....	....
Louisiana	....	....	....	....
Mississippi	....	43,392.39	35,702.35	21,740.27
Missouri	....	....	....	....
North Carolina	....	....	....	....
South Carolina	....	....	....	....
Tennessee	....	....	....	....
Texas	....	....	....	....
Virginia	....	....	....	....
Administration	....	....	....	....

* In September, 1917, the hookworm work in the Southern States began to be absorbed in the being longer in some states than in others, it was not possible to announce until the end of 1920 regular functions, responsibility for all efforts directed toward the relief and control of hookworm

** Reports incomplete.

Years 1913 to 1922, Inclusive, Covering All Activities—Cont'd

1919	1920	1921	1922	Total
$2,439.25	**$8,182.77**	**$167,765.19**	**$205,701.78**	**$386,766.47**
....	....	18,231.35	21,915.97	40,147.32
....	....	....	607.22	607.22
....	....	237.75	772.08	1,009.83
....	....	4,338.17	2,790.68	7,128.85
....	....	....	1,927.94	1,927.94
....	....	....	**1,641.66	1,641.66
....	....	....	954.18	954.18
....	4,494.00	6,316.99	13,095.38	23,906.37
....	....	16,316.41	16,057.84	32,374.25
....	....	5,618.28	15,397.58	21,015.86
2,264.25	....	1,762.59	7,168.18	13,872.50
....	....	15,652.72	11,713.47	27,366.19
....	....	600.00	9,391.41	9,991.41
....	957.04	10,837.52	**8,508.03	20,302.59
....	....	14,413.38	7,169.78	21,583.16
....	....	....	4,441.17	4,441.17
....	....	17,651.97	12,302.18	29,954.15
....	....	14,686.42	**14,406.26	29,092.68
....	....	12,765.65	**13,765.65	26,531.30
....	....	13,972.74	11,319.44	25,292.18
175.00	2,731.73	4,164.56	5,089.15	12,160.44
....	....	10,198.70	12,968.13	23,166.83
....	....	....	12,298.40	12,298.40
34,965.08	**133,929.02**	**150,551.39**	**155,938.84**	**596,349.17**
....	8,906.92	7,650.06	15,416.93	31,973.91
13,505.66	7,048.90	4,777.15	6,388.11	51,849.65
....	....	....	3,111.12	3,111.12
....	1,230.86	....	2,017.08	3,247.94
....	....	....	422.80	422.80
....	30,699.94	22,929.88	17,365.78	70,995.60
21,167.37	27,537.43	21,185.61	8,901.06	179,626.48
....	....	1,471.37	2,900.00	4,371.37
....	7,526.13	18,676.30	9,046.96	35,249.39
....	13,942.74	13,321.90	10,892.31	38,156.95
....	1,969.94	1,512.56	**3,666.65	7,149.15
....	11,472.34	10,347.23	2,307.84	24,127.41
....	5,284.84	831.65	6,062.08	12,178.57
....	6,032.20	10,198.68	....	16,230.88

programs of the rapidly developing county departments of health. The period of transition that in all the states the county health departments would henceforth assume as one of their and other soil-borne diseases.

TABLE 2: *Expenditures of the International Health Board for the*

Activity, State, and Country	July 1, 1913–Dec. 31, 1915	1916	1917	1918
Malaria Control—*Continued*				
Foreign Countries:				
Argentina.....	$........	$........	$........	$........
Brazil........	....	....	....	....
Ecuador	....	....	....	....
Nicaragua	....	....	....	....
Palestine......	....	....	....	....
Philippine Islands	....	....	....	....
Porto Rico....	....	....	....	....
Miscellaneous:				
Conference of Malaria Workers	....	....	....	....
Study of Source of Blood Meals of Anopheles Mosquitoes..	....	....	....	....
Yellow Fever Control	....	41,863.17	9,344.03	46,639.17
Yellow Fever Commission.........	....	41,863.17	7,727.74	....
East Coast of Brazil and Caribbean...	....	....	1,616.29	2,897.97
Brazil............	....	....	....	....
Ecuador..........	....	....	....	29,473.98
Guatemala........	....	....	....	14,267.22
Mexico and Central America........	....	....	....	....
Peru.............	....	....	....	....
Salvador..........	....	....	....	....
Epidemic Work....	....	....	....	....
Training of Personnel for Commission to West Africa..........	....	....	....	....
Vaccine and Serum	....	....	....	....
History of Yellow Fever	....	....	....	....
Tuberculosis in France.............	....	....	51,856.24	443,030.43
Inauguration of Work...........	....	....	18,671.74	....
Department of Organization	....	....	....	....

* Reports incomplete.

Years 1913 to 1922, Inclusive, Covering All Activities—Cont'd

1919	1920	1921	1922	Total
$........	$........	$5,661.02	$........	$5,661.02
292.05	....	....	22,043.09	22,335.14
....	4,595.59	....	....	4,595.59
....	425.66	6,662.51	8,091.00	15,179.17
....	....	....	*7,250.11	7,250.11
....	....	....	6,077.50	6,077.50
....	5,445.18	24,914.84	23,978.42	54,338.44
....	1,810.35	245.00	....	2,055.35
....	....	165.63	....	165.63
94,526.42	**139,757.40**	**239,057.53**	**209,981.99**	**781,169.71**
44,271.12	83,717.13	....	....	177,579.16
....	....	....	....	4,514.26
....	....	461.30	469.68	930.98
48,396.77	28,574.98	1,698.06	3,017.05	111,160.84
967.82	....	....	....	15,235.04
....	....	156,562.54	161,221.39	317,783.93
....	....	80,335.63	36,041.68	116,377.31
890.71	3,926.26	....	....	4,816.97
....	23,539.03	....	....	23,539.03
....	....	....	3,000.00	3,000.00
....	....	....	6,000.00	6,000.00
....	....	....	232.19	232.19
602,775.78	**518,013.51**	**359,540.31**	**268,274.49**	**2,233,490.76**
....	....	....	....	18,671.74
....	139,364.76	47,281.28	24,044.27	210,690.31

TABLE 2: *Expenditures of the International Health Board for the*

ACTIVITY, STATE, AND COUNTRY	July 1, 1913–Dec. 31, 1915	1916	1917	1918
TUBERCULOSIS IN FRANCE—*Cont'd*				
Public Health Division	$........	$........	$........	$........
Central Administration	....	....	18,292.10	80,037.65
Educational Division	....	....	5,316.39	85,755.19
Medical Division	....	....	9,576.01	267,237.59
Contingent Fund	....	....	....	....
Postgraduate Tuberculosis Courses	....	....	....	....
PUBLIC HEALTH EDUCATION	....	9,256.74	12,376.63	36,642.82
Department of Hygiene, São Paulo	....	....	179.59	32,788.84
Institute of Hygiene, Czechoslovakia	....	....	....	....
Public Health Institutes	....	....	....	....
Fellowships	....	....	971.85	2,353.98
Adviser in Medical Education	....	....	11,225.19	1,500.00
Schools of Public Health	....	....	....	....
Medical Commission to Brazil *	....	9,256.74	....	....
Study of Teaching of Hygiene and Public Health in Medical Schools	....	....	....	....
PUBLIC HEALTH ADMINISTRATION	....	....	....	....
United States:				
Missouri—Division of Sanitary Engineering	....	....	....	....
Utah—Division of Sanitary Engineering	....	....	....	....

* Represents one half total expenditure.
** Reports incomplete.

Years 1913 to 1922, Inclusive, Covering All Activities—Cont'd

1919	1920	1921	1922	Total
$........	$76,191.46	$101,473.08	$99,525.30	$277,189.84
72,394.12	86,310.57	89,575.04	74,747.28	421,356.76
141,053.34	135,920.64	79,839.90	62,422.55	510,308.01
389,328.32	80,226.08	40,621.01	....	786,989.01
....	....	750.00	2,490.94	3,240.94
....	....	....	5,044.15	5,044.15
38,367.71	68,373.54	89,094.44	173,332.39	427,444.27
23,582.57	29,929.01	24,727.16	....	111,207.17
....	....	204.51	....	204.51
....	....	3,466.64	3,324.02	6,790.66
13,118.47	38,409.84	60,696.13	114,637.24	230,187.51
1,666.67	....	....	....	14,391.86
....	....	....	55,371.13	55,371.13
....	....	....	....	9,256.74
....	34.69	....	....	34.69
....	....	....	77,917.73	77,917.73
....	....	....	1,050.00	1,050.00
....	....	....	**636.33	636.33

TABLE 2: *Expenditures of the International Health Board for the*

ACTIVITY, STATE, AND COUNTRY	July 1, 1913–Dec. 31, 1915	1916	1917	1918
PUBLIC HEALTH ADMINISTRATION—*Cont'd*				
Canada:				
New Brunswick	$........	$........	$........	$........
Brazil............	....	....	....	....
Czechoslovakia	....	....	....	....
Australia	....	....	....	....
Philippine Islands ..	....	....	....	....
League of Nations:				
Interchange of Public Health Personnel ...	....	....	....	....
PUBLIC HEALTH LABORATORY SERVICE........	....	....	....	....
United States:				
Alabama......	....	....	....	....
Kansas.......	....	....	....	....
Missouri......	....	....	....	....
Tennessee.....	....	....	....	....
Foreign:				
Guatemala....	....	....	....	....
Nicaragua	....	....	....	....
Salvador......	....	....	....	....
Demonstrations....	....	....	....	....
Administration	....	....	....	....
MISCELLANEOUS........	30,196.00	27,628.35	18,191.76	23,034.17
Czechoslovakia Public Health Work..	....	....	....	....
Paris Conference on International Nomenclature of Causes of Death	....	....	....	....
Compilation of Mining Sanitary Code	....	....	....	....
Survey Public Health Administration in Massachusetts........	....	....	....	....
Investigation of Powdered Milk ..	....	....	....	....
Medical Commission to Brazil *	....	9,256.73	....	....

* Represents one half total expenditure.
**Reports incomplete.

Year 1913 to 1922, Inclusive, Covering All Activities—Cont'd

1919	1920	1921	1922	Total
$........	$........	$........	$9,000.00	$9,000.00
....	....	....	14,630.10	14,630.10
....	....	....	5,534.47	5,534.47
....	....	....	20,000.00	20,000.00
....	....	....	12,046.83	12,046.83
....	....	....	15,020.00	15,020.00
....	....	**16,109.70**	**26,304.39**	**42,414.09**
....	....	....	**3,340.13	3,340.13
....	....	2,539.88	5,468.14	8,008.02
....	....	....	874.99	874.99
....	....	....	250.00	250.00
....	....	307.50	621.75	929.25
....	....	85.18	2,345.53	2,430.71
....	....	984.34	1,028.72	2,013.06
....	....	....	206.33	206.33
....	....	12,192.80	12,168.80	24,361.60
46,901.63	**51,248.30**	**59,652.90**	**17,719.15**	**274,572.26**
....	12,708.81	20,736.31	....	33,445.12
....	615.30	....	....	615.30
....	....	125.98	77.20	203.18
26.09	1,467.27	....	....	1,493.36
....	500.00	....	....	500.00
....	....	....	....	9,256.73

TABLE 2: *Expenditures of the International Health Board for the*

Activity, State, and Country	July 1, 1913–Dec. 31, 1915	1916	1917	1918
Miscellaneous—*Cont'd*				
Visit of Brazilian Scientists to United States ...	$........	$........	$........	$........
British Advisory Committee......	2,561.36	....	....	....
Field Equipment and Supplies	742.88	....	2,464.68	3,000.00
Surveys and Exhibits	26,478.81	18,371.62	13,854.57	14,970.85
Pamphlets and Charts..........	874.36	....	1,335.66	3,999.49
Library...........	1,844.12	....	....	....
Express, Freight, and Exchange ...	....	....	536.85	1,063.83
Refunds which could not be credited direct to budget..	−(2,279.03)	....	....	....
Visit to England and the United States of French Scientist............	....	....	....	....

Years 1913 to 1922, Inclusive, Covering All Activities—Cont'd

1919	1920	1921	1922	Total
$........	$........	$7,660.12	$........	$7,660.12
....	....	....	....	2,561.36
23,434.94	5,996.96	4,982.25	5,189.62	45,811.33
16,870.71	23,528.78	13,437.76	....	127,513.10
5,499.50	5,873.33	10,153.44	8,869.43	36,578.71
....	....	....	....	1,844.12
1,070.39	557.85	2,557.04	1,469.28	7,255.24
....	....	....	....	−(2,279.03)
....	....	....	2,113.62	2,113.62

CHINA MEDICAL BOARD

Report of the Director

To the President of the Rockefeller Foundation:

Sir:

I have the honor to submit herewith my report as Director of the China Medical Board for the period of January 1, 1922, to December 31, 1922.

Respectfully yours,

ROGER S. GREENE,

Director.

CHINA MEDICAL BOARD

In 1922 the China Medical Board completed its eighth year of work in China. The earlier years had been devoted, first, to study of the field and of the methods of operation most likely to contribute toward the progress of medical science, and, second, to the raising of standards in medical education and hospital practice.

Through the organization of the premedical school of the Peking Union Medical College a demonstration was given of the type of training in the fundamental sciences which has been found necessary in western countries as a preparation for the study of medicine. This was followed by the gradual building up of the medical school proper with a new faculty and new physical equipment. During this stage also grants were made to other medical schools and hospitals, largely under foreign auspices, to help them to effect improvements which they had themselves planned. Through the establishment of fellowships for study in Peking and abroad, efforts were also made to prepare workers who would be able later to take part in a larger development. In these earlier years there was a gratifying demonstration of the

capacity of the Chinese as students, as teachers of the medical sciences, and as practitioners, accompanied by definite progress in the elevation of standards in medical education and practice.

With the year 1922 a new phase of the Board's activities began in the initiation of systematic efforts to improve the teaching of the natural sciences in the colleges and universities of China, as an indispensable factor both in the further improvement of medical education and research and in the extension of the opportunities for securing a medical training to a larger number of individuals. The program adopted included proposals for aiding in the construction and equipping of laboratories and for temporary contributions toward maintenance of science departments on a better basis. But probably more important results are to be expected from the provision of fellowships to enable teachers to pursue advanced studies at home or abroad, and of visiting professorships by which institutions in China may secure inspiration and guidance from successful teachers of other countries who will be in residence long enough to gain some understanding of the special problems with which the Chinese universities are confronted.

Finally, in the year 1922 the Board undertook

its first significant co-operation with Chinese institutions and it was natural that this co-operation should begin in the fields of physics, chemistry, and biology. In the earlier stages of the development of the modern system of education in China foreign institutions may apparently be of real service as experimental demonstrations, from the successes and failures of which valuable lessons may be learned. In times of financial and political difficulty they possess a relative stability which gives them a great advantage. From them may come some of the leaders who will later achieve large results by working through their own national institutions. The contribution of foreign schools and colleges is therefore recognized by many Chinese leaders in education as an important one, both in quantity and in quality, and this is particularly true in respect to their science teaching, but it is generally admitted that the future of education in China must depend on institutions supported and controlled by the Chinese themselves. Fortunately, in recent years the number of Chinese qualified by academic training and by practical experience to take the lead in education has been rapidly increasing, and these men are now becoming prominent in a few governmental and private universities of real promise.

NOTE: Statistical tables and charts covering the expenditures of the Board since its inception will be found on pages 311–327.

I. PREMEDICAL EDUCATION

The standard requirements in the natural sciences for admission to medical studies involve only courses of a relatively elementary type in chemistry, physics, and biology. Hitherto, however, none of the universities and colleges in Chinese territory has had the staff and equipment to give such courses in all three of these subjects in a really satisfactory manner, to say nothing of the more advanced work in the fundamental sciences from which most of the future development of medicine must come. Unless, therefore, each medical school were itself to maintain under its own control complete departments of physics, chemistry, and biology—a plan which has not worked well elsewhere—the strengthening of the universities, where the sciences can be studied for their own sake and with a broader scope, was urgently needed.

In the spring of 1922 the Secretary of the Board proceeded to China for a preliminary study of the field in preparation for the intensive program for the promotion of science teaching that had been decided upon in the previous year. Later, arrangements were made to co-operate with the Chinese National Association

for the Advancement of Education in sending to China Professor George R. Twiss of Ohio State University to investigate science teaching in the middle schools and colleges of the country under the auspices of that association, and to suggest improvements in organization, teaching methods, and equipment. Dr. Twiss's work has been primarily with institutions maintained by the Chinese government and by Chinese private organizations. Finally, in the fall the Board secured the services of Mr. N. Gist Gee, for many years professor of biology at Soochow University, as its adviser on premedical education, to take charge of this branch of its work. Mr. Gee arrived in China in October, 1922, and immediately began a study of conditions in those colleges with which the Board was already co-operating.

Conditional grants for laboratory buildings, equipment, and maintenance for a limited term, were made during the year to two Chinese institutions, the National Southeastern University at Nanking and the Nankai University at Tientsin, and to one mission institution, Peking University, commonly known by its Chinese name of Yenching University to distinguish it from the Peking National University maintained by the Ministry of Education. In each case substantial assurance was received that the funds

from other sources necessary to make the Board's appropriations available would be forthcoming.

The National Southeastern University was established in 1921, with the Teachers' College, which had been maintained at Nanking since 1915, as its nucleus.

While the University depends mainly on government funds for its support, it has also received gifts from private individuals, and in recognition of this fact a board of trustees has been organized which includes in its membership a number of prominent business men from the cities of the lower Yangtze valley. Its physical plant, including land, buildings, and equipment, is valued at about Mex. $1,200,000, or about $637,000 gold, and its budget for 1922–1923, including both ordinary maintenance and special expenditures, came to a total of Mex. $601,381, or about $320,000 gold.

The University proper is now divided into a College of Arts and Science, and Colleges of Education, Engineering, and Agriculture, all at Nanking, and a College of Commerce at Shanghai. Below the university grade there are the Teachers' College, which has been retained to train teachers for the grade schools, and a preparatory department. The teaching and administrative staff included 283 persons, of whom

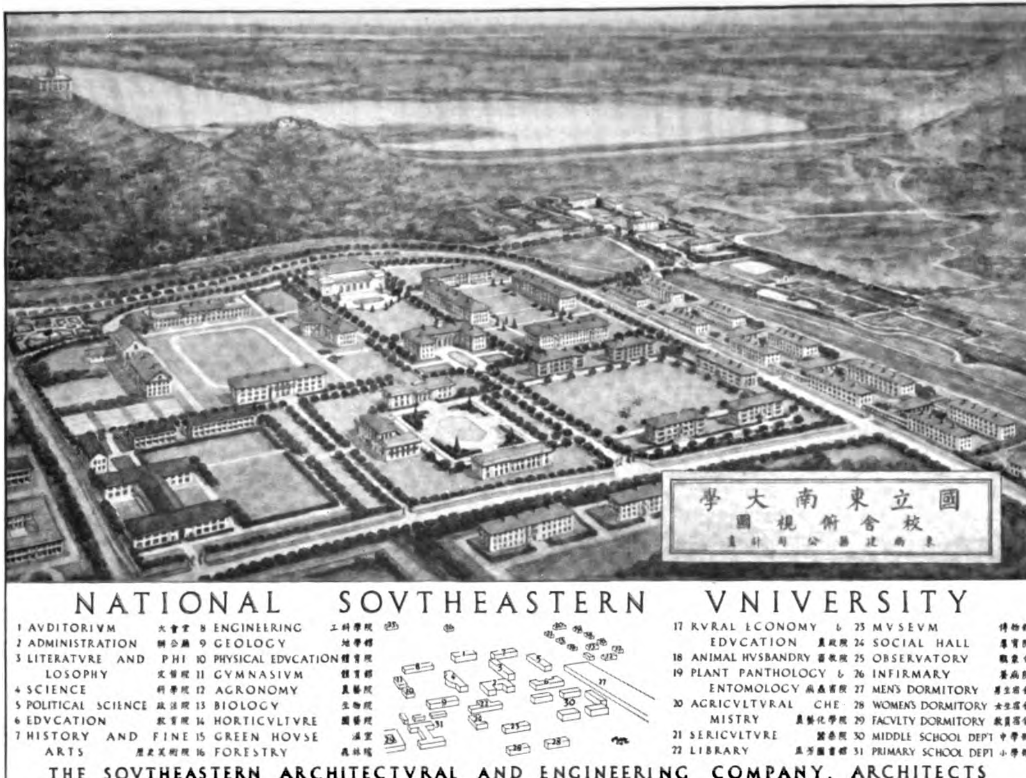


Fig. 66.—Bird's-eye view of Southeastern University, Nanking

Fig. 67.—Students at work in the physics laboratory, Southeastern University, Nanking

eighty-three were employed in the practice schools for middle and primary grades. Of these teachers a large proportion have studied in the best universities of Europe and the United States. Twenty full professors were added to the staff in 1922. A survey of the science departments shows a more nearly adequate staff than is possessed by any other college in China. There are three men with foreign education in the division of botany and three assistants trained in the Nanking and Peking Teachers' Colleges; the division of zoology has two graduates from American universities and three locally trained men; in the department of chemistry there are four teachers with foreign training and three local graduates; and the department of physics has three Chinese graduates of American and British universities, besides an American visiting professor, Dr. O. H. Smith, of Cornell College, Mount Vernon, Iowa, and four instructors or assistants educated in China.

In the fall term there were 718 students of whom 117 were in the university proper, 317 in the Teachers' College, 126 were special students, and 158 were in the preparatory department. The students are a carefully selected group. Only 120 were admitted last year out of some 1,200 candidates. While the majority of the students naturally come from the three prov-

inces of the lower Yangtze valley, nineteen provinces and two foreign countries were represented in the total registration. Fifty-nine of the students came from the remote province of Szechuan.

The most urgent need of the institution is for modern laboratories and equipment. In 1922 the China Medical Board pledged Mex. $100,000 toward a laboratory building, Mex. $25,000 toward new equipment, and Mex. $6,750 per annum for three years toward salaries of additional teachers, on condition that equal amounts should be secured from other sources for the same purposes. The Board also undertook to provide a visiting professor of physics for one year.

In close association with the University is the Bureau of Entomology of the Province of Kiangsu, which has carried on successful work in keeping down flies and mosquitoes in various localities, and is planning to deal also with insects which attack field crops and fruit-trees. Dr. C. W. Woodworth, of the University of California, has had charge of this work during the past year and is returning for another year of service.

Nankai University, at Tientsin, grew out of what is perhaps the most successful secondary school in China, the Nankai Middle School,

organized by a group of public-spirited Chinese citizens, but subsidized by the provincial government. The University, which was opened in 1919, depends wholly on tuition fees and private contributions for its support.

The University is at present in temporary quarters adjoining the Middle School, but it has acquired a new site of about eighty acres, and two buildings were already under construction in 1922, an administration building and a dormitory, which together will cost about Mex. $110,000. The budget now comes to about Mex. $117,000 per annum, which is divided between departments of arts, science, commerce, and mining engineering. Most of this is covered by income from endowment.

Of the twenty-eight teachers in the college, twenty-five are Chinese who have studied abroad; and three are foreigners teaching English, French, and German. In the science department there are two foreign-trained teachers of chemistry, two in physics, and one in biology, besides two assistants.

The student body in the fall of 1922 numbered 325, including twenty-six women. As it has been necessary to limit the classes on account of the large number of applicants a well-selected group of students has been secured. There are 86 students in the arts course, 54 in the science

course, 124 in commerce, and 61 in mining engineering.

In 1922 the China Medical Board made appropriations to Nankai College of Mex. $100,000 toward a laboratory building, $25,000 toward new equipment, and $6,750 per annum for three years toward salaries of additional teachers of physics, chemistry, or biology, on condition that equal amounts should be secured from other sources. By the end of the year the sums necessary to make available the grants for building and equipment were practically assured and plans for the laboratories had been prepared. Provision was also made for a visiting professor of physics from the United States for the year 1923–1924.

Peking (Yenching) University is conducted by a board of trustees representing one British and three American missionary societies. The University is still housed in temporary quarters, but during 1922 work was begun on the construction of a fine plant outside the walls of the city. By the end of the year about $600,000 had already been raised for new buildings and a vigorous campaign was under way for $1,000,000 more. The annual budget amounts to about $90,000, of which about half is contributed by the mission boards. A college for women is an organic part of the University, and during the year some

$600,000 was raised for the special buildings required for this department, in addition to the general building funds of the University. A competent faculty is being organized and special efforts are being made to secure strong Chinese teachers who may be able to take a constantly increasing share of the responsibility. There were in 1922 thirty Chinese and forty-one foreign members of the faculty, and 425 students were enrolled.

As a part of its program for the strengthening of science departments in the colleges of China, and also with a view to relieving the Peking Union Medical College as soon as possible of the necessity of maintaining a preparatory department in connection with the medical school, the China Medical Board undertook to aid the University in securing the staff, laboratories, and equipment needed to enable it to prepare students for admission directly to the medical school. A grant of $7,500 per annum for two years was made in 1922 toward the maintenance of the science departments, and at the close of the year a pledge was made of Mex. $150,000 for the construction and equipment of a laboratory building, on condition that the University should provide an equal sum for a second laboratory building with its equipment.

The China Medical Board has been co-oper-

ating with the Canton Christian College since 1920 in the development of its science teaching, primarily with a view to preparing students for admission to medical schools. This institution has been more successful than any other mission college in China in securing substantial support from the Chinese community and from Cantonese abroad, many of whom have not only prospered in business but have also retained great interest in the welfare of their native province. The College now possesses buildings valued at Mex. $792,000, and its budget for the year 1922–1923 comes to a total of Mex. $656,737, of which $519,263 comes from local sources. Up to July 1, 1922, it had received Chinese gifts amounting to Mex. $531,000, of which about two thirds was given for permanent buildings.

The number of teachers in the College and affiliated schools last year was 171, of whom 120 were Chinese. Twenty of these Chinese teachers hold foreign degrees. In the college proper there were 107 students, including women, and seventy-three registered as sub-freshmen and special students. The science teachers trained abroad include two biologists, three chemists, and three physicists.

In 1922 the China Medical Board contributed toward the expense of sending to the College a

visiting professor of physics, Dr. W. W. Stifler, formerly Dean of the Premedical School of the Peking Union Medical College, besides continuing previous grants towards maintenance expenses of the science departments.

The China Medical Board continued during the year 1922 its co-operation with the science departments of St. John's University, Shanghai, the Fukien Christian University, and the College of Yale-in-China at Changsha.

The colleges under foreign auspices, of which the institutions named above are examples, are for the most part older than the Chinese institutions and have on the whole a larger proportion of science instructors with considerable teaching experience gained both at home and in China. In some cases one or two departments have been raised to a surprising degree of excellence, usually through the efforts of some one individual who has carried a burden of routine work that would have overwhelmed the average teacher. These colleges are therefore in a position to make a special contribution at this stage of the development of the Chinese educational system.

No other new enterprises in the field of premedical education were undertaken by the China Medical Board during the year. Most of the government institutions have suffered from the serious financial situation of the national and

provincial governments and have therefore been unable to consider much new development, while many of the foreign mission colleges have been discussing plans for reorganization and concentration of effort involving in some cases rather radical changes.

The leaders in missionary education appear to be convinced of the advisability of coming together to plan for the best use of the funds likely to be available for higher education. One outstanding need appears to be the strengthening of the secondary schools in order that they may serve better both those students who will complete their formal education at that stage and those who are preparing for further study in the universities. Another need is for the division of the very limited resources in men and money among a smaller number of colleges and universities, at least until more financial support can be secured locally. Everywhere the university administrators feel keenly the need of adding both to their annual budgets and to their physical equipment in order to bring their work up to the rapidly rising standards of instruction that are now demanded in China, but it seems difficult to raise the money necessary for such development in all of the existing colleges.

Any radical reorganization will bring many complications but it is gratifying to note the far-

sighted way in which some institutions are facing these problems. Plans for union and co-ordination of effort between different nationalities and different denominations are being seriously discussed. At one time the difficulties in the way of such co-operation would have seemed insuperable. Now, however, rivalry based on denominational or national differences has become relatively insignificant. There is still more or less conflict between the claims of various localities, and institutional pride in China still seems to operate occasionally in ways contrary to the best interests of the work as a whole, though perhaps less so than in some other countries. But in spite of these difficulties real progress is being made.

II. MEDICAL EDUCATION

The Peking Union Medical College

In the summer of 1922 the Peking Union Medical College completed its first year of work in its new hospital and valuable experience was gained through the operation of the whole of the new plant, with the exception of certain hospital wards, which though ready for use were held in reserve for future expansion.

During the academic year 1921–1922 three classes were under instruction in the medical school proper, and undergraduate clinical teaching was begun with the third-year students. In the fall, with the admission of new students, there were for the first time four classes under instruction. The registration is still small, as will be seen from the following comparative statement of enrollment in all departments for the academic years 1921–1922 and 1922–1923:

	1921–1922	*1922–1923*
Medical School		
Fourth year	..	4
Third year	5	5
Second year	6	9
First year	11	17
Total	22	35
Premedical School		
Third year	18	22
Second year	21	17
First year	24	32
Total	63	71

School of Nursing		
Fourth year	..	..
Third year	..	1
Second year	1	7
First year	8	6
Total	9	14
GRAND TOTAL	94	120

The enrollment of graduate and special students is not easily comparable with the undergraduate registration, as it includes a large number of persons taking short courses of only a few weeks duration, in addition to those spending the whole or the greater part of the year in study. There are also included a few members of the staff taking courses in departments other than those in which they are teaching. In the year 1921–1922 there were fifty-nine such graduate and special students of whom all were in the medical school except six who were taking work in physics, chemistry, biology, pharmacy, nursing, and dietetics. When the last reports were received there had already been 127 graduate and special students registered for the academic year 1922–1923, of whom 110, including voluntary assistants, were in the medical school.

The staff of the college has also been enlarged. Teachers of pediatrics, dermatology, and oral surgery were added, and some of the departments which had been organized previously were rein-

forced. The increase in staff is shown in the following table:

	1921–1922			1922–1923*		
	Foreign	*Chinese*	*Total*	*Foreign*	*Chinese*	*Total*
Medical school teaching staff...............	33	18	51	38	23	61
Administrative officers, resident hospital staff, and chief technicians.	38	22	60	38	26	64
Premedical school teaching staff............	11	5	16	12	6	18
School of nursing and hospital nursing staff.	26	5	31	28	8	36
	108	50	158	116	63	179

During parts of the year 1922 there were also present the following visiting professors and lecturers: Dr. E. G. Brackett, of Boston, in orthopedics (six weeks); Dr. E. C. Dudley, of Chicago, in obstetrics and gynecology (completing a year's service); Dr. Ernst Fuchs, of Vienna, in ophthalmology (one month); Dr. H. R. Slack, of Johns Hopkins Medical School, Baltimore, in otolaryngology (beginning a year's service); and Dr. Donald D. Van Slyke, of the Rockefeller Institute, New York, in biochemistry (three months). Dr. R. B. Seem, of the University of Chicago, completed in the summer of 1922 a service of a year and four months as superintendent of the college hospital. There were also two honorary lecturers appointed locally, Dr. S. P. Chen, Medical Director of the Government

* To December 31, 1922.

Fig. 68.—Graduate and undergraduate students in special course in orthopedic surgery given by Dr. E. G. Brackett of Boston

Fig. 69.—Students and instructors in special graduate course, Department of Medicine, Peking Union Medical College

Isolation Hospital, in infectious diseases, and Dr. Alice Cook-Willner in otolaryngology.

In the spring of 1922 an exchange of lecturers was arranged with the South Manchuria Medical College, under which Professor Y. Kuno, of Mukden, gave a series of lectures and demonstrations at Peking on the physiology of the pericardium and the pericardial cavity, while Dr. C. W. Young, of the Peking Union Medical College, reported at Mukden the results of his recent studies of kala-azar. In the summer and fall three members of the department of surgery served for short periods in the Shantung Christian University Medical School, assisting in clinical work and in teaching during the absence on furlough of a member of the University staff.

These visits and exchanges have proved very useful in lessening the isolation of scientific workers in China. In particular, the visitors from abroad have done much to stimulate and encourage both teachers and graduate students, while their presence in clinics and laboratories has been an inspiration also to the undergraduates.

The formal graduate courses conducted in 1922 were in the following subjects: physiological chemistry, medicine, ophthalmology, orthopedic surgery, roentgenology, obstetrics and gynecology. A summer course in educational hygiene

was given for school administrators. The graduate teaching offered for 1923 includes a course in general surgery and provision for informal work in pharmacology under the general direction of Dr. Reid Hunt, professor of pharmacology in the Harvard Medical School.

It is hoped that the medical profession of China will derive real benefit from the courses offered to them, but there is no doubt that the teachers themselves will profit from the association thus made possible with men from schools and hospitals in other parts of the country.

While the members of the staff have been largely occupied with their teaching and clinical duties, many of them have found time to pursue studies of their own, the results of which have been published in scientific journals in Europe, America, and China. The papers published in 1921 were assembled in a volume under the title of *Contributions from the Peking Union Medical College*, Volume I, and similar volumes will be prepared annually. A list of the papers published in 1922, which form the second volume, is annexed to this report (see pages 328, 329).

It will be noted that some of the studies in the volume deal with subjects of special interest to medical practitioners in China. In some cases valuable help has been secured from physicians outside the institution, particularly in field work.

Furthermore, facilities are occasionally offered at the college to workers from other institutions to carry on investigations in which they are interested. There is therefore reason to believe that the research activities of the college are being conducted in such a manner as to furnish still another point of mutually helpful contact between the teachers and the profession at large.

Opportunity for discussion of new work by the staff as a whole is afforded by the Staff Medical Society and the Journal Club which meet twice monthly in alternate weeks. Once a month the Medical Society meets with the Peking Branch of the China Medical Missionary Association. A Peking Branch of the Society of Experimental Biology and Medicine was organized by members of the faculty in the fall of 1922 under authority from the parent society, and meets at irregular intervals. The Chinese members of the staff, besides participating in these organizations, take a leading part in the Peking Branch of the National Medical Association of China, a body which now includes a considerable number of Chinese physicians and surgeons with good modern training.

In the fall of 1922 the number of beds available in the hospital was increased from 161 to 196 in order to provide more cases for teaching purposes, and space for about fifty more patients is still

held in reserve. The beds are distributed between departments as follows: Medicine, including neurology, pediatrics, and dermatology, 60; surgery 46; gynecology 6; obstetrics 18; ophthalmology 10; otolaryngology 7; isolation 8; admission 11; private (first and second class) 30; total 196.

During the year ending June 30, 1922, 2,653 in-patients were treated, and the total number of days of hospital treatment was 42,555. For the six months ending December 31, 1922, the number of in-patients was 1,520, representing 23,828 treatment days. About one third of the patients have been women, and the women's wards have generally been full, which seems to indicate that there is no serious objection on the part of Chinese women to entering a general hospital.

The demand for treatment in the out-patient department has been so great that it was early found necessary to limit the admission of new patients to three days in the week and to raise the fees in order to conserve the time of the staff for their other duties. Old patients are still seen daily. About 20 per cent of the cases are given free treatment. The total number of visits for the year ending June 30, 1922, was 74,763, of which 15,249 were first visits, making an average of nearly five visits per person. In the six months

ending December 31, 1922, the average number of visits per patient increased to about 5.5.

The prejudice against autopsies has not yet been overcome, but gradual progress is being made as a result of the efforts of the staff. Altogether thirty-three autopsies were performed during the year ending June 30, 1922, or 21.5 per cent of the number of deaths. In the next eight and a half months autopsies were secured in thirty-one cases, a proportion of 24.8 per cent to the total deaths. This improvement was due in large part to the more willing co-operation of the authorities whose permission is required in each case. A weekly pathological conference is held by the department of pathology for the students and the hospital staff.

The salaried members of the staff, a group which includes all the faculty except two honorary lecturers, give their whole time to the work of the institution, and have no private practice from which they receive income. Frequent requests are made for the services of members of the staff by persons able and willing to pay reasonable fees, but in order to prevent undue encroachment on the time of the staff it has been found necessary, except in special cases, to limit this class of work, as far as foreigners are concerned, to patients referred by physicians outside the institution. This restric-

tion also serves to prevent undesirable competition with the foreign private practitioners who are established in Peking.

As so frequently happens, calls were made upon the staff for emergency service during the year. After the fighting near Peking in the spring, sixty-five of the severely wounded soldiers were admitted to the hospital. Later a unit made up in part of volunteers from the Language School was sent to Kaifeng, the capital of Honan province, with complete equipment, including portable X-ray outfits, to care for the wounded in that vicinity. An X-ray unit was also sent to Paotingfu, the headquarters of one of the contending armies. The demonstration of the X-ray in these two places led the local commanders to present to the mission hospitals in those cities the funds necessary for the purchase and installation of similar small X-ray plants, and one of the generals decided to purchase an outfit for the use of his own medical corps.

An advisory committee, consisting for the present of eight Chinese gentlemen well known in the community for their interest in education and in philanthropic work of various kinds, was established by the trustees in 1922. This committee promises to be of great service in interpreting to the Chinese people the purposes and policies of the institution, and in advising the


Fig. 70.—Staff of the Department of Medicine, Peking Union Medical College

Fig. 71.—Physics laboratory, Premedical School, Peking Union Medical College

officers in matters requiring special knowledge of local conditions. It is hoped that the members of the committee may also take an important part in the promotion of medical enterprises under Chinese control. The following gentlemen have kindly consented to serve on this committee:

Mr. Sun Pao-ch'i, Director General of Customs, Chairman.
Mr. Hsiung Hsi-ling, formerly Minister of Finance and Premier.
Duke Tze Tsan-hsi, in charge of Manchu relief enterprises.
Mr. Tsai Yuan-p'ei, Chancellor of the National University of Peking.
Surgeon General Ch'uan Shao-ch'ing, formerly Director of the Army Medical College.
Admiral Ts'ai T'ing-kan, Assistant Director General of Customs.
Dr. Chang Po-ling, President of Nankai University.
Dr. Chou Yi-ch'un, formerly President of Tsing Hua College.

The health of the students and junior Chinese members of the staff has given the faculty considerable concern. As in other similar groups in China there has been a distressing incidence of tuberculosis in particular, amounting in one year to 7.1 per cent for the Chinese students and staff, and the number of persons whose general physical condition is not satisfactory has been large. For this reason a rigorous physical examination has been instituted for all candidates for

admission. Provision has been made also for systematic physical exercise under competent direction and for frequent outings in the hills during holidays and week-ends. The curriculum is being studied with a view to reduction of required hours, and in some cases it has been necessary to discourage students from remaining in the laboratories after the regular working hours. There is a general impression that the average Chinese student is below the average Anglo-Saxon student in physical development and stamina. A fundamental remedy for this condition must be sought in the homes and in the lower schools, but in the meantime special precautions must be taken to safeguard the health of students who are pursuing an intensive professional course under conditions new to many of them, and in a climate very different from that in which the students from the central and southern parts of China were brought up.

The former hospital building on Hsin Kai Lu, now known as Wenham Hall, was entirely remodeled during the year to serve as a dormitory for men students, and an addition is under construction which will permit the accommodation of 160 men in all. A special suite for four teachers is provided in this building. The old dormitory, Oliver Jones Hall, now serves as quarters for seventy women students and Chi-

nese graduate nurses, besides four of the senior nurses who occupy a separate suite.

The premedical school has been co-operating during the past year with Peking (Yenching) University. Professor C. H. Corbett, of the University, has had charge of the department of physics in the premedical school, and the heads of the departments of chemistry and biology in the premedical school have supervised the teaching of their subjects in the University. Some of the more advanced classes from the University have been taught in the premedical school laboratories. Plans have been completed for the new science laboratories of the University, and it is hoped that all of the premedical work may be transferred to them not later than the fall of 1925. Reference has been made elsewhere to the development of the science departments of other universities and colleges from which it is hoped that the medical school will soon be able to draw well-prepared students.

The School of Nursing maintained in connection with the hospital of the College is making steady progress, and though the registration is still small, the course is already attracting young women of a fine type, with good preliminary education. Middle school graduation or its equivalent is required for admission, and the first year is then spent exclusively in classroom

and laboratory work, much of it in physics, chemistry, and biology. The whole course takes four years. It is not assumed that a course of this length should be the standard for all nurses' training schools in China, but the urgent need at present seems to be for highly trained nurses with a broad educational background who will be competent to serve as teachers and supervisors, and it is primarily this need which the school is designed to meet. Since the Chinese middle school has hitherto been at least one year behind the standard of the American high school, and since it is necessary for the present that the nurses in a teaching hospital should speak English well, the nursing course of four years does not seem too long.

Only women are now admitted to the School of Nursing, but there have been under instruction two classes of male nurses who were admitted in the old hospital. The last of these classes is to graduate in 1923. No regular courses for graduate nurses have been offered, but altogether fifty-two nurses trained in China (twenty-three men and twenty-nine women) have lately been employed in the hospital, and have received some instruction in nursing and in English.

Expenditures under the budget amounted in 1921–1922 to Mex. $1,191,214 ($632,654 gold), toward which Mex. $191,538 was secured from

hospital earnings, professional fees, rentals, etc. The China Medical Board provided the balance, which, with the contingent fund and expenditures in America, amounted to $547,533.

Other Medical Schools

Plans for further concentration of medical education in China under foreign missionary auspices were under discussion in 1922, particularly with a view to the establishment of a school at Shanghai in which all those interested in teaching medicine through the medium of the English language in central and east China might unite, possibly with some degree of co-operation from a group interested in medical education of the same type for women. The Pennsylvania Medical School of St. John's University at Shanghai and the Hunan-Yale College of Medicine at Changsha were the institutions most affected by this proposed development, which had been recommended by the Educational Commission sent to China by the mission boards of Great Britain, the United States, and Canada in 1921. No final plans had been adopted at the close of the year and the uncertainties regarding the future naturally created some difficulties for the institutions concerned.

In the north, however, arrangements were under way for the union of the North China

Union Medical College for Women, now at Peking, with the Shantung Christian University Medical School at Tsinan, and there is a prospect that most of the women students may be transferred to Tsinan during the academic year 1923–1924. This union will add strength to the Shantung Christian University and will at the same time give the women students the benefit of instruction by a more nearly complete faculty, with better laboratories and hospital facilities.

The Foochow Union Medical College has not admitted a new class for four years and is now closed, at least for the time being.

These developments illustrate clearly the desire of the mission leaders in medical education to look at their work from a national point of view and to avoid unwise scattering of resources among a large number of inadequately supported schools. That there is room for such concentration is shown by the relatively small number of students and teachers in eight medical schools in China under mission auspices, the total number of their graduates in 1922 being only ninety-one. The total number of students enrolled in 1921–1922 in thirty separate classes was 300, or an average of only ten to a class. Three schools had only forty-six students between them in nine separate classes. While all these schools have a five-year course, not all of them admit

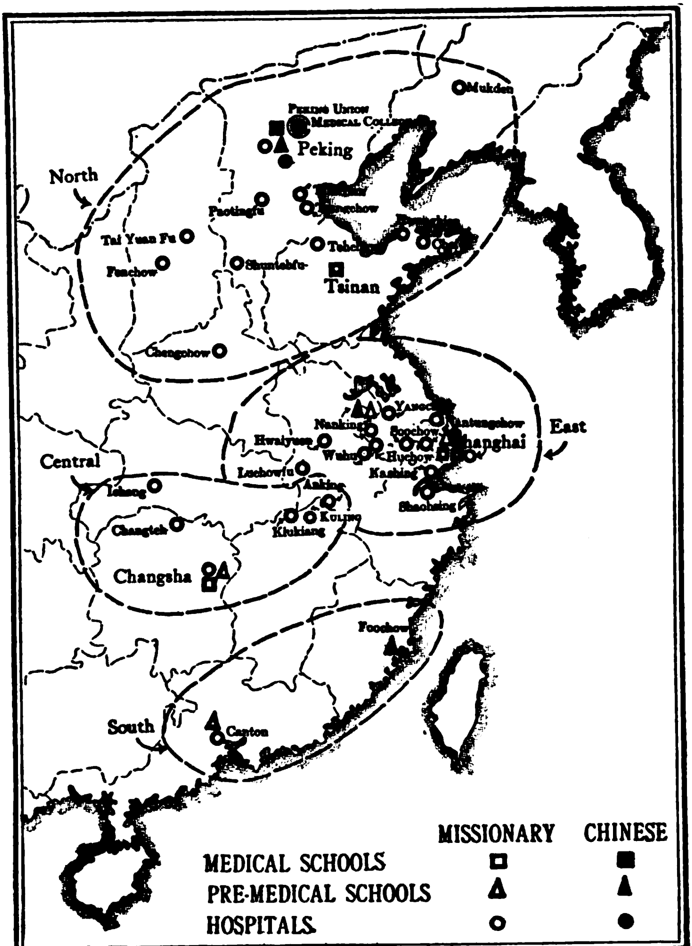


Fig. 72.—Location of institutions which have received appropriations from the China Medical Board

new classes every year, partly on account of shortage of teachers. The total number of teachers was 143 of whom 105 gave all their time to teaching and to work in the school hospitals. Of the thirty-eight part-time teachers some contribute very little to the teaching. While the total comes to a very considerable figure, one of the schools had only six teachers and another only eight, while the largest number was twenty-five. The clinical branches are relatively well supplied, though several schools are without qualified teachers of some of the important clinical specialties; but most of the schools feel more keenly their lack of trained teachers for the fundamental medical sciences, these subjects being usually taught as side-issues by men or women who are primarily interested in clinical work. In recent years the stronger schools have made marked progress toward remedying this defect. Missionary doctors and promising Chinese who have shown special interest or ability in laboratory work have been relieved of clinical duties and have been given opportunities for special study abroad and in China. In selecting new teachers, also, more emphasis is being placed on scientific qualifications, and as a result one now finds here and there very creditable departments of anatomy or pathology, though physiology and its various branches are still scantily represented.

The number of beds for teaching purposes in the hospitals used by these eight schools comes to a total of 1,214, not including an insane asylum with about 600 inmates, to which one school has access. The smallest number in any one institution is sixty-five, and the largest number available for any one school is 272, though in this case the beds are divided between two hospitals, the larger of which is at some distance from the school and from the teaching hospital actually controlled by the school. The best organized schools have 115 to 155 beds conveniently located for regular teaching.

The financial resources of some of these schools are not readily ascertainable, as the salaries of most of their teachers are paid by the missions to which they belong and do not appear in the school accounts. The budgets vary greatly. At one extreme some of the schools have almost no expenditures except the salaries of the few teachers and no income but the meager hospital earnings and tuition fees, possibly not exceeding $25,000, in United States currency, per annum. The most prosperous school has an annual budget of Mex. $178,276 (about $94,700 gold), of which Mex. $32,198 (about $17,100 gold) is supplied from local income, principally tuition fees and hospital earnings, while the remainder is covered by grants from various organizations

in China and abroad. As nearly as can be estimated, the total annual expenditures of these schools and the hospitals controlled by them cannot be less than Mex. $900,000, or nearly $500,000 gold.

Much more effective educational work could be done with such a sum if it could be divided among two or at most three schools, but there are many difficulties in the way. In the first place, many of the hospitals used by the schools were established long before they were used for teaching and have become important local institutions in which teaching is even now more or less incidental. Even when they are controlled by the same organizations which control the schools there would be much natural objection to closing the hospitals as part of a plan of concentration. In some cases contributions are received from the local Chinese or foreign community which could not be transferred to an institution in another city, and in other cases the mission constituency at home has a special interest in its original work for a given city or province which might easily be lost if the enterprise were merged in a larger institution in a different part of the country. It is sometimes said also that the closing of a school in a given locality would mean the loss of many promising students who would be unwilling or unable to

attend a school in a city remote from their homes. This is doubtless true, but it is also a fact that most of the better colleges and professional schools of China draw an astonishingly large number of their students from remote provinces, and this seems to indicate that many of the most enterprising Chinese students are willing to travel far to get what they want in the way of an education, just as their fathers used to flock to Peking from all corners of the Empire to compete in the higher literary examinations. When the need for more doctors is everywhere so urgent one cannot but sympathize with those who are reluctant to close any existing medical school that is turning out useful practitioners, even if the graduates are few in number and not fully trained according to the best standards. There is now so general a desire for higher standards that there is good ground for confidence that those responsible for the existing medical schools will find some wise solution for the perplexing problem with which they are confronted.

Steady progress appears to have been made in all the medical schools with which the Board has been co-operating; the number of qualified teachers has increased and the student body is better prepared. Year by year the number of Chinese in responsible positions in schools under

foreign auspices is becoming larger, and there is reason to hope that the time is not far distant when a majority of the teachers will be Chinese who will be the equals of their western colleagues in scientific attainments, and better qualified to deal with the problems of their own country than foreigners can be.

1. *The Shantung Christian University School of Medicine*

A most striking example of the tendency toward concentration is found in the School of Medicine of the Shantung Christian University. In 1922 another mission, not previously participating, began to contribute to the support of the school, making a total of ten missionary societies aiding in the work as against two eight years ago. While the share taken by some of the societies is small on account of the difficult financial situation which they have to face at home, the broad basis that has been secured gives more security and hope for larger support in the future. A hospital board of managers containing a majority of Chinese, several of whom are influential citizens of Tsinan, has been organized, and through this body more local support is being secured for the hospital. The physical plant was enlarged in 1922 by the construction of a home for the Chinese women nurses of the hospital.

The development of the faculty has been such as to justify great encouragement. Two new teachers began work in the fall of 1922. Three others were under appointment, and one member of the faculty returned after a year of experience in teaching in a junior position at the Johns Hopkins Medical School. There is the further prospect of the addition of five teachers through the co-operation of the missions interested in the North China Union Medical College for Women. The following list of the present faculty will help to give an idea of the way in which the staff is being rounded out:

President:
  Harold Balme, F.R.C.S. (Eng.), D.P.H. (Lond.).

Dean:
  Samuel Cochran, A.B. (Princeton), M.D. (College of Physicians and Surgeons, N. Y.).

Anatomy:
  Laurence Maitland Ingle, B.A., M.B., B.Ch. (Cantab.).
  Hui-wen Wang (Shantung).

Histology, Embryology (and Parasitology):
  Randolph Tucker Shields, B.A. (Washington and Lee), M.D. (Med. Coll. of Virginia).

Physiology:
  Philip S. Evans, Jr., B.A. (Yale), M.D. (Johns Hopkins).

Biological Chemistry:
  Peter C. Kiang, A.B. (St. John's), M.D. (Penn.).

Pharmacy:
- C. T. Y. Ch'eng (Maryland).
- W. Percy Pailing, M.P.S., B.D. (Lond.).

Therapeutics (and Translation):
- Thomas Gillison, M.B., C.M. (Edin.).

Bacteriology:
- Samuel Cochran, A.B. (Princeton), M.D. (Coll. of Phys. and Surg., N. Y.).
- Chi-hsien Chang (Shantung).

Pathology:
- Louis H. Braafladt, B.A. (Decorah), M.S. (University of Chicago), M.D. (Rush).
- Pao-chang Hou (Shantung).

Public Health:
- Charles Titterton Maitland, B.Sc., B.S., M.D. (Lond.), M.R.C.P., D.P.H., D.T.M. & H.

Medicine:
- William McClure, B.A., M.D., C.M. (McGill).
- Francis Henry Mosse, M.A. (Oxon.), M.R.C.P. (Lond.).
- Ernest B. Struthers, B.A., M.D. (Toronto).

Dermatology and Syphilology:
- Leroy F. Heimburger, M.D. (St. Louis).

Surgery:
- Harold Balme, F.R.C.S. (Eng.), D.P.H. (Lond.).
- Edwin Robert Wheeler, M.B., B.S. (Lond.), M.R.C.S., L.R.C.P.
- Thornton Stearns, B.A. (Davidson), M.D. (Johns Hopkins).

Surgery and Urology:
- Henry Wardel Snarey Wright, M.B., M.S. (Lond.), F.R.C.S. (Eng.).

Gynecology and Obstetrics:
- Helena Rosa Wright, M.B., B.S. (Lond.), M.R.C.S. (Eng.).

Surgery, Otolaryngology:
David John Evans, M.B., Ch.B. (Birmingham).
Ophthalmology:
Ta-chih Pa (Peking Union Medical College).
Radiology and Electro-Therapeutics:
John Stanley Ellis, M.A. (Cantab.), M.R.C.S., L.R.C.P.
Translation:
P. Lonsdale McAll, B.A. (Cantab.), M.B., B.Ch. (Edin.).

While it will be seen that the number of Chinese teachers is still small, the policy of the school is to increase it as vacancies occur for which qualified Chinese candidates can be found. At the beginning of the year five graduates from the Shantung Christian University were appointed to internships in the Peking Union Medical College Hospital, all of them being men with considerable knowledge of English, though they had studied medicine in Chinese.

In the spring of 1922, upon the expiration of its previous grants, the China Medical Board made an appropriation to this school of Mex. $33,000 a year for four years.

2. *The Hunan-Yale College of Medicine*

The Hunan-Yale College of Medicine, toward which the Board is contributing under earlier appropriations, has labored under special difficulties on account of the impoverishment of the

provincial treasury from which part of its support comes, though it received a somewhat larger proportion of its government grant than some strictly official institutions. Chinese government institutions, including medical schools, in most parts of the country have suffered in the same way, and there is little prospect of immediate relief.

The faculty of this school in 1922 included the following teachers:

Dean:
- Fu-chen Yen, B.A. (St. John's, Shanghai), M.D. (Yale), D.T.M. (Liverpool), M.A. Hon. (Yale).

Anatomy:
- Shueh-yi Li, B.S., M.D. (Syracuse).

Physiology:
- Russell F. Maddren, M.D. (Univ. of Oregon).

Pathology:
- Heng-pi Chu, M.D. (Harvard Medical School of China).

Medicine:
- Edward H. Hume, B.A. (Yale), M.D. (Johns Hopkins).
- John H. Foster, B.S. (Colby), M.D. (Univ. of Pa.).
- George Hadden, M.B., C.M. (Edinburgh).
- Gerald S. Shibley, B.A., M.D. (Columbia).
- Chao-feng Tang, M.D. (Univ. of Michigan).

Dermatology:
- Tsing-liang Li, B.A., M.D. (St. John's, Shanghai).

Pediatrics:
- Louise W. Farnam, B.A. (Vassar), Ph.D., M.D. (Yale).

Preventive Medicine:
Reginald M. Atwater, B.A. (Colorado College), M.D. (Harvard), C.P.H., D.P.H. (Johns Hopkins).

Surgery:
Albert S. Crawford, B.A. (Pomona College), M.D. (Cornell).
Edward Y. Kau, M.D. (Harvard Medical School of China).
Russell F. Maddren, M.D. (Univ. of Oregon).

Gynecology:
J. R. Bromwell Branch, B.A., M.D. (Johns Hopkins).

Otology:
W. S. Thacker Neville, B.A., M.B., Ch.B., M.D., F.R.C.S.

Urology:
Morris B. Sanders, B.A. (Washburn College), M.D. (Harvard).

Obstetrics:
W. Clayton Grosvenor, M.A., M.D., M.Ch., F.R.C.S.E. (Edinburgh).

Ophthalmology:
Fu-chen Yen, B.A. (St. John's, Shanghai), M.D. (Yale), D.T.M. (Liverpool), M.A. Hon. (Yale).

Dentistry:
Harry C. Chang, D.D.S. (Baltimore College of Dental Surgery).

Pharmacy:
George K. How, Phar.G. (Univ. of Maryland).

It will be noted that reference is made above to only a few medical schools, with which the China Medical Board is co-operating. There is also developing a system of medical schools

under the national and provincial governments which, working under serious difficulties, have made creditable progress in many cases. As soon as political conditions become more favorable a great improvement in these institutions may be expected, and it is probable that the future of western medicine in China will rest largely with them. There are also a few private schools of some promise conducted under Chinese auspices in different parts of the country.

Finally, mention should be made of the South Manchuria Medical College conducted at Mukden under Japanese auspices with a well-qualified staff and excellent equipment, and of the University of Hongkong, a British institution which has won the recognition of the General Medical Council of Great Britain through its adherence to high standards in medical education. Both of these schools are likely to exercise a powerful and beneficial influence on the progress of scientific medicine in China.

No new enterprises in the field of medical education were undertaken by the Board in 1922, as further development of the teaching of the fundamental sciences seemed necessary before there could be much extension of medical teaching on a sound basis.

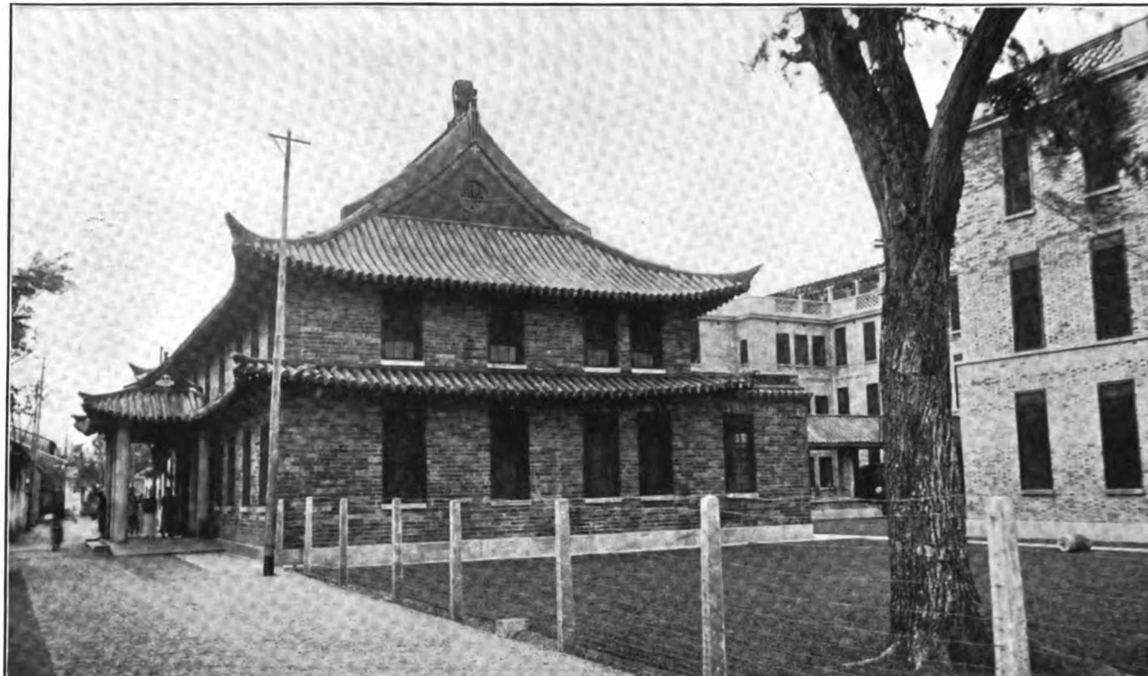


Fig. 73.—Soochow Hospital, out-patient department in the foreground

Fig. 74.—Public ward for men, new Soochow Hospital

III. HOSPITALS

With the great improvement that has taken place in hospital standards in China in recent years, the need for participation by the Board in such enterprises on a large scale seems to be passing, but no abrupt termination of its co-operation with institutions which have made effective use of funds previously entrusted to them has been contemplated.

During the year 1922 contributions towards maintenance were renewed on a reduced scale to six mission hospitals and appropriations toward buildings were made to five mission hospitals at Nanking, Soochow, Mukden, Tehchow, and Hwaiyuan.

The Soochow Hospital of the Southern Methodist Mission was completed and occupied during the year. The plant includes hospital and dispensary buildings constructed and equipped at a cost of Mex. $237,000, a hostel for convalescents and light cases awaiting treatment in the hospital or dispensary, and four staff residences. The nurses' quarters are at present in the main hospital building. In this building, besides wards for seventy-five patients, there are two

operating rooms, an X-ray suite, two laboratories, a modern laundry and kitchen, refrigerating plant, and animal rooms. The roof forms a great sun-parlor with open air cubicles for patients. Electric current is supplied from the plant of Soochow University; telephones and a nurses' call system have been installed; the building is heated by steam, and hot and cold water are supplied throughout. Both the hospital and the dispensary are of fire-proof construction, being of brick and reinforced concrete with terrazzo floors and steel window-sashes. It is hoped that experience with this modern hospital, the first mission hospital not connected with a medical school to be so completely equipped, will be of great value, since the construction is not too expensive to be widely imitated, in the larger cities at least, in so far as its new features prove to be adapted to Chinese conditions. The staff has been enlarged and now includes Chinese doctors who received their education in the United States. Women nurses are being gradually substituted for men throughout the hospital, an innovation which will be watched with much interest. This hospital enjoys a large measure of Chinese support. Gifts from Chinese toward the building fund amounted to Mex. $24,000.

During the year the Board set apart a sum of $10,500 to be used for extension of X-ray work

in China. For some time Dr. P. C. Hodges, roentgenologist of the Peking Union Medical College, has been making a special study of the conditions under which X-ray work must be carried on in the isolated hospitals in China, where expert help is usually not available and great difficulties have to be contended with in varying climatic conditions, and in the absence or irregularity of public electric light plants. Complete units have been designed and built to meet these special conditions at a moderate cost, under the auspices of the X-ray committee of the China Medical Missionary Association. Dr. Hodges has conducted summer courses in roentgenology to prepare men for X-ray service, and he has aided by correspondence and visits in various parts of the country, in planning, installing, and repairing equipment in twenty-four hospitals.

The Board also contributed last year Mex. $3,000 towards a total of $6,000 for the installation of X-ray equipment in the Red Cross General Hospital at Shanghai. This hospital was entirely reorganized early in the year by a group of Chinese physicians and surgeons who are unusually well qualified by education and experience. Most of them were trained in Great Britain or the United States and have also had several years of experience under favorable

conditions in China. A nurses' training school has been started under a Chinese graduate of the Johns Hopkins Hospital Training School. Improvements costing Mex. $18,490 have been made in the buildings and equipment and now for the first time the Chinese physicians and surgeons of Shanghai have under their control hospital facilities not inferior to those available for foreign doctors. The hospital has a capacity of seventy-four beds, of which forty-eight are in public wards. The budget for 1922 amounted to Mex. $50,000, of which the Chinese Red Cross Society contributed $10,000.

The organization of this institution, controlled and financed by Chinese and attended by a Chinese staff, is one of the most encouraging developments of recent years in the field of medicine in China. Its success will doubtless lead to similar enterprises in other communities and will serve to make plain to young men in the colleges of China the opportunities for useful service to their country through the medical profession.

A distinct turning-point has been reached in the development of hospitals not connected with medical schools. In recent years there has been a gratifying elevation of hospital standards throughout China. A few institutions in strategic locations have been aided by the Board to take important steps forward by provision for

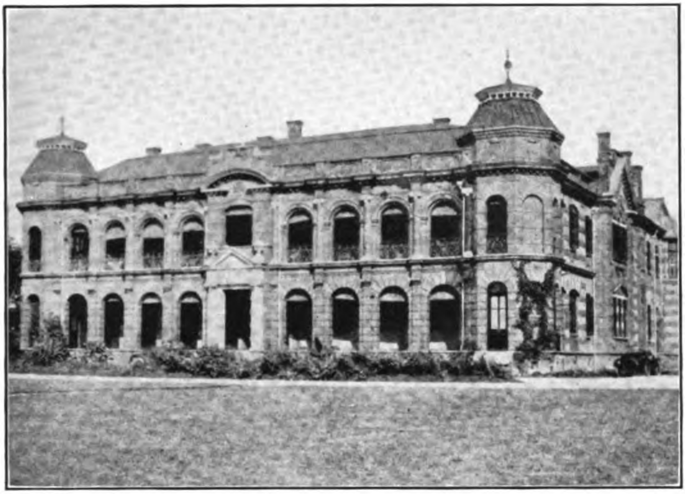


Fig. 75.—Administration and private ward building, Red Cross General Hospital, Shanghai

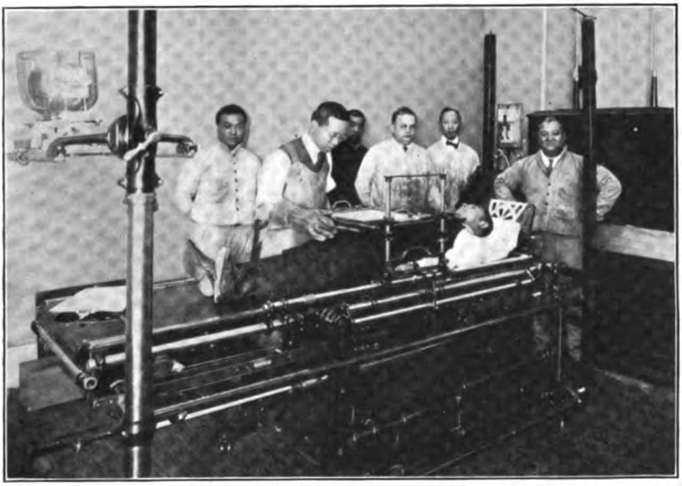


Fig. 76.—X-ray room, Red Cross General Hospital, Shanghai

Fig. 77.—Organic chemistry laboratory, Premedical School, Peking Union Medical College

Fig. 78.—Biological laboratory, Premedical School, Peking Union Medical College

additional workers and in some cases by contributions to new buildings and equipment. More generous support is coming from the communities which these hospitals serve and from their friends abroad. The task of providing hospital accommodation for the Chinese people at large is evidently one that must soon be taken up by the Chinese people themselves on a large scale, and the foreign service must be mainly of the nature of experimentation and demonstration as a result of which the people of the country may adopt those features of the modern hospital which have proved their value under actual conditions in China. There are already far more openings for competent physicians and surgeons in fairly well-equipped hospitals than there are men and women to fill such positions. The best way to aid the hospitals, therefore, seems to be to promote medical education. The appreciation of western medicine by great masses of the Chinese people is now so genuine that the energetic and competent doctor will soon be able to secure for himself, at least in the larger cities, the physical equipment that he needs to make his work effective. For these reasons a gradual withdrawal of the China Medical Board from co-operation with hospitals not connected with medical schools seems wise in order that more attention may be devoted to the pressing needs of medical and premedical education.

IV. FELLOWSHIPS

Recognizing the necessity of continuing the process of education beyond the period of formal undergraduate instruction, the Board has continued its policy of granting fellowships for graduate study. These grants have been of two general types:

1. Fellowships designed to prepare selected individuals for definite positions, usually as teachers in medical and premedical schools, or to give opportunities for advanced study during furlough periods to persons already engaged in such educational work. These fellowships are usually for study in the United States or Europe, but in some cases the first stages of the work are undertaken in Peking.

2. Fellowships to enable a larger number of physicians engaged in institutional work other than teaching to inform themselves of recent advances in medical science or to prepare themselves for work in the specialties. Hitherto a number of such fellowships have been given for study abroad, but in the future this more extensive type of work will be carried on almost exclusively at the Peking Union Medical College.

During the year 1922, fellowships for study in

the United States or Europe amounting in all to $10,400 were assigned to fourteen teachers in medical schools and the science departments of colleges, including four from Peking, four from West China, three from Tsinan, two from Changsha, and one from Mukden; fellowships to the amount of $5,650 were voted to seventeen doctors in mission hospitals, and scholarships to the amount of $1,200 to four foreign nurses. New fellowships and scholarships or renewals were granted to six Chinese doctors, one premedical teacher, one nurse, one pharmacist and one student of medical photography. Of these ten persons, eight were members of the staff of the Peking Union Medical College or were being prepared for such positions, one was from the faculty of Yale-in-China, and one from the Shantung Christian University. The total appropriation for fellowships in the United States and Europe, including travel and tuition in some cases, amounted to $48,000.

Appropriations for fellowships for Chinese at the Peking Union Medical College for the academic year 1922–1923 amounted to $10,000. An appropriation of $6,500 was also made for fellowships for foreign physicians and teachers during the calendar year 1922. The following table shows the number of Chinese and foreigners at-

tending different courses from January to December, 1922:

Departments	Number of Fellows			Approximate Period of Residence	
	Chinese	Foreign	Total	Chinese	Foreign
				Days	Days
Medical School					
Anatomy	3	1	4	203	60
Bacteriology	5	..	5	594	..
Biochemistry	2	..	2	143	..
Hygiene	9	1	10	267	25
Medicine	9	10	19	699	535
Obstetrics and Gynecology	2	13	15	162	149
Ophthalmology	12	10	22	766	463
Otolaryngology	1	1	2	90	183
Parasitology	2	..	2	135	..
Pharmacology	1	..	1	164	..
Pathology	1	..	1	210	..
Roentgenology	6	8	14	113	224
Surgery	5	3	8	274	79
Premedical					
Biology	1	..	1	210	..
Chemistry	1	..	1	180	..
Physics	1	..	..	165	..
Hospital					
Dietetics		1	1	..	30
Hospital Administration		1	1	..	30
Pharmacy	1	..	1	60	..
Social Service	1	..	1	105	..
Unspecified	1	..	1	30	..
Total	64	49	112	4,570	1,778
Deduction for Persons Registered for two Courses	3	3	6	..	..
Net total	61	46	106	4,570	1,778

Fig. 79.—Map showing distribution of holders of fellowships for study in the Peking Union Medical College during 1922. Sixty Chinese and forty-five foreigners were provided by the China Medical Board with sufficient funds for study in Peking. In some cases the period of study covered a full school year; in others, not more than one or two months, which were devoted to a special course

V. MISCELLANEOUS

The China Medical Missionary Association plays an important part in medical progress in China, particularly through its *Journal*, its Councils on Medical Education and Hospital Administration, and its Publication Committee. In 1922 the Board pledged Mex. $15,000 per annum for two years and Mex. $10,000 per annum for three years thereafter to enable the Association to secure the services of an executive secretary and to improve its *Journal*, which is to appear monthly hereafter instead of every two months.

The North China American School at Tungchow near Peking renders a valuable service to the American community in North China by providing instruction under healthful conditions to American children through the high school grades. As such schools cannot rely on taxation for support they must appeal to individuals and organizations in the territory which they serve. The China Medical Board and the Peking Union Medical College have depended mainly upon the Peking American School for the education of the children of members of the staff, but since some attend the school at Tungchow a grant of

Mex. $5,000 was made in 1922 towards the general funds of that institution.

A detailed statement of appropriations, receipts, and expenditures for the year will be found in the report of the Treasurer of the Rockefeller Foundation.

In the following pages a graphic presentation is given of the expenditures of the China Medical Board since its establishment in 1914.

APPENDIX

I

Tables and Charts

It will be noted (Table I, Fig. 80) that with the practical completion of the Peking buildings the total expenditures for 1922 fell to the lowest point that had been reached since 1917, the gross expenditures for that year amounting to only a little over $1,200,000. A reference to the exchange chart (Fig. 82) will show also that the price of silver has become very near normal according to pre-war standards.

Medical Education. While silver expenditures for the maintenance of the Peking Union Medical College have steadily increased, gold expenditures for 1921 were considerably less than for the previous year on account of the rapid fall in the price of silver at the end of 1920 (Table I, Fig. 80). Expenditures for other medical schools (Table II, Fig. 81) have decreased, partly because aid given to the Harvard Medical School of China and the allied Red Cross Hospital ceased in 1919, and partly because both the Shantung Christian University and the Hunan-Yale Medical School succeeded in expanding their work to some extent through income from other sources.

Premedical Education. While plans for wider co-operation in premedical work were adopted in 1922, no large payments were called for in that year, and consequently the years 1920 and 1921, when considerable payments were made for buildings for St. John's and Fukien Christian Universities, appear to represent the peak in this branch of effort (Table III, Fig. 81). The year 1923 will probably show an increase, with payments for laboratories for Peking University, Nankai College, and the National Southeastern University.

Hospitals. Disbursements for hospitals reached their maximum in the last two years, but this is due largely to the carrying out of certain new projects postponed during the war, and to delayed settlement of accounts for prior years (Table IV, Fig. 81). A gradual decrease in the relative amounts of such appropriations may be expected.

Fellowships. The expenditures were highest in the period 1917 to 1919 when a number of men, both foreign and Chinese, intended for posts in the Peking school were being supported while studying in the United States. Some of these men received allowances considerably in excess of the usual stipends as they were receiving no salary at that time. The year 1922 shows a noticeable increase owing to the facilities offered at Peking (Table V, Fig. 81). No decrease but rather a gradual increase is to be expected in this kind of expenditure during the next few years.

Unclassified expenditures have included grants to the North China Union Language School for the construction and equipment of permanent buildings, for translation of medical and nursing textbooks and for aid of medical association activities (Table I, Fig. 81).

TABLE 1: *Summary of Expenditures*

	1914	1915	1916	1917
PEKING UNION MEDICAL COLLEGE				
Land, Buildings and Equipment	$.....	$63,951	$222,739	$71,931
Maintenance—Operation	.....	14,905	22,891	48,662
PROPOSED SHANGHAI MEDICAL SCHOOL	.....	....	93,217	126,547
MEDICAL EDUCATION ELSEWHERE	.....	21,606	60,701	91,142
PREMEDICAL EDUCATION	.....	....	....	30,465
HOSPITALS—MISSIONARY AND CHINESE	1,000	1,025	46,452	48,969
FELLOWSHIPS AND SCHOLARSHIPS	.....	10,672	33,264	43,315
UNCLASSIFIED *	.....	600	2,319	3,381
ADMINISTRATION—C.M.B.	38,271	44,864	64,301	33,488
TOTALS	$39,271	$157,623	$545,884	$497,900

* The unclassified appropriations include aid to committees engaged in translation and in the standardisation of medical terminology, to the North China Language School where members of the staff of the Peking Union Medical College have studied, and to schools for the children of the staff.

† The increase in this item in the years 1921 and 1922 is due to the fact that a share of the

of the China Medical Board, 1914–1922

1918	1919	1920	1921	1922	TOTALS
$1,618,807	$2,453,458	$2,772,186	$1,091,069	$219,741	$8,513,882
117,117	355,166	483,060	393,349	623,944	2,059,094
79,022	26,017	23,808	12,259	Cr. 1,288	359,582
92,887	61,428	58,538	34,278	15,484	436,064
....	35,900	142,806	76,514	55,358	341,043
123,686	127,624	60,940	140,630	140,594	690,920
51,318	39,557	29,081	27,423	30,510	265,140
1,957	7,142	14,901	13,626	5,981	49,907‡
45,678	65,108	56,262	113,598†	115,302†	576,872
$2,130,472	$3,171,400	$3,641,582	$1,902,746‡	$1,205,626	$13,292,504

office expenses of the Rockefeller Foundation for information service, bookkeeping department, purchasing department, etc., has been charged against the China Medical Board since January 1, 1921.

‡ Funds returned through the sale of land and materials in Peking and in Shanghai brought in a total of $52,704, reducing the expenditures for the year 1921 to $1,902,746.

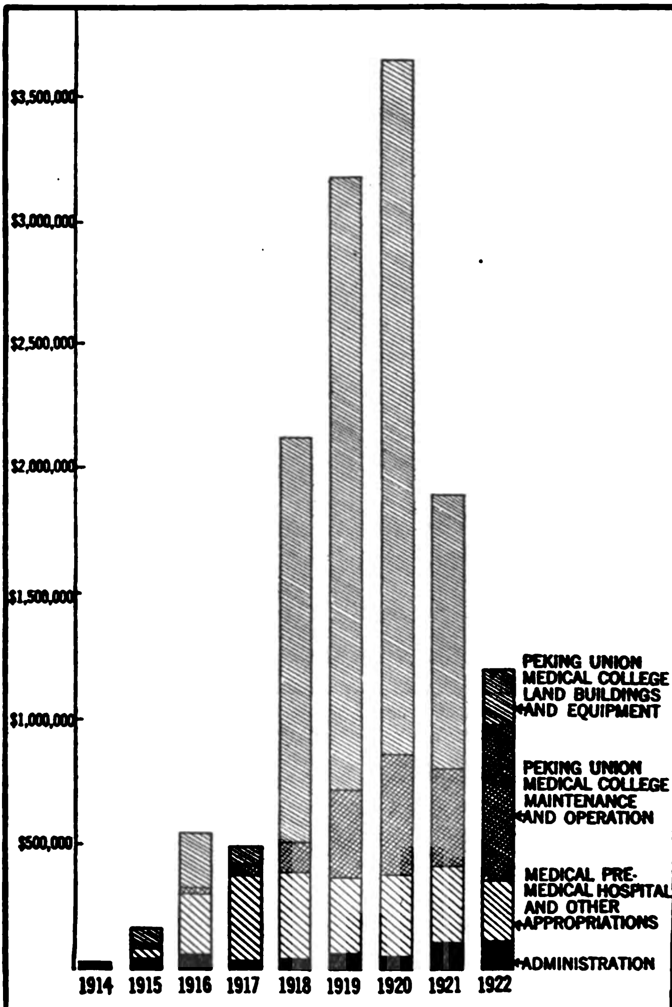


Fig. 80.—Analysis of expenditures of the China Medical Board for the years 1914–1922

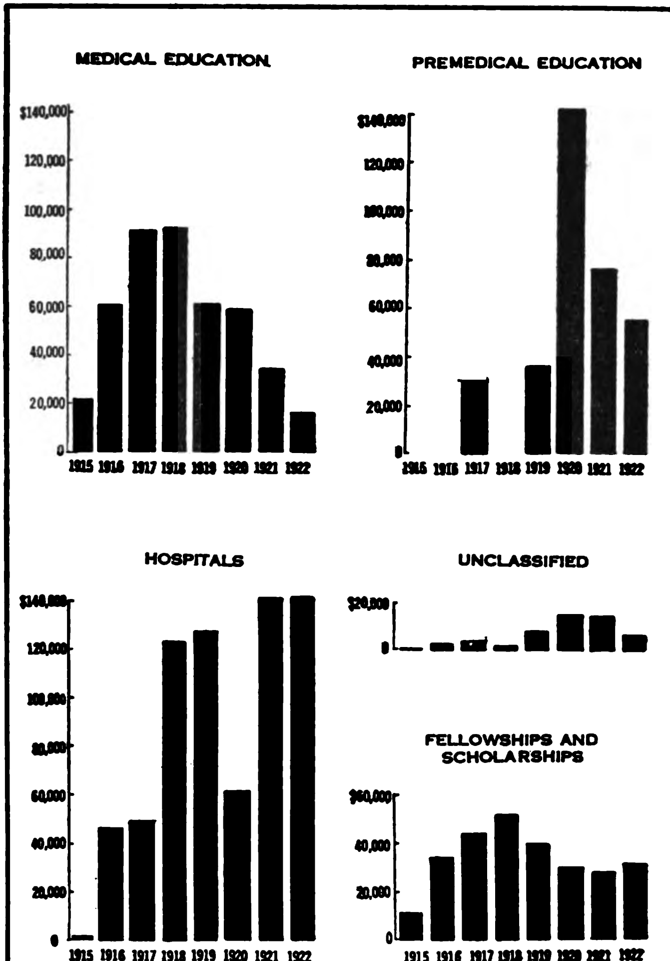


Fig. 81.—Expenditures for purposes other than the Peking Union Medical College, the proposed Shanghai School, and administration, 1915–1922

TABLE 2: *Summary of Expenditures for Medical Education in Shanghai School, 1915–1922*

	1915	1916	1917	1918
A. Mission Schools				
Harvard Medical School of China and Red Cross Hospital, Shanghai.....	$15,000	$11,507	$14,528	$35,338
St. John's University.....	....	1,500	1,500	1,500
Shantung Christian University................	....	30,000	54,914	39,849
Hunan-Yale Medical School................	6,606	17,694	20,200	16,200
Totals...............	$21,606	$60,701	$91,142	$92,887
B. Chinese School				
National Medical College, Peking...........	....	....	....	....
Total................	....	....	....	....

TABLE 3: *Summary of Expenditures for Premedical Education in*

	1915	1916	1917	1918
A. Mission Schools				
Study of Premedical Education in China........	$.......	$.......	$.......	$.......
Canton Christian College	....	....	....	....
Fukien Christian University....................	....	....	....	....
Ginling College.........	....	....	....	....
St. John's University.....	....	....	....	....
Yale in China...........	....	....	30,465	....
Peking (Yenching) University....................	....	....	....	....
Totals...............	....	....	$30,465	....
B. Chinese School				
Southeastern University..	....	....	....	....
Aid to National Association for Advancement of Education in study of science teaching.......	....	....	....	....
Total................	....	....	....	....

s other than the Peking Union Medical College or the Proposed

919	1920	1921	1922	TOTALS
$3,728	$........	$.......	$........	$80,101
1,500	1,500	1,500	1,500	10,500
37,000	40,000	27,291	13,984	243,038
19,200	17,038	....	....	96,938
$61,428	$58,538	$28,791	$15,484	$430,577
....	....	$5,487	....	$5,487
....	....	$5,487	....	$5,487

ichools other than the Peking Union Medical College, 1915–1922

1919	1920	1921	1922	TOTALS
$........	$........	$........	$5,157	$5,157
....	28,522	5,610	....	34,132
22,700	49,784	45,616	22,700	140,800
....	....	8,300	....	8,300
1,200	63,000	7,180	5,500	76,880
12,000	1,500	9,808	13,153	66,926
....	....	....	5,625	5,625
$35,900	$142,806	$76,514	$52,135	$337,820
....	....	....	$2,737	$2,737
....	....	....	486	486
....	....	....	$3,223	$3,223

TABLE 4: *Summary of Expenditures*

	1914 to 1915	1916	1917	1918
A. Mission				
American Baptist				
Shaohsing	$.......	$.......	$.......	$3,937
American Board (Congregational)				
Fenchow	....	....	....	....
Tehchow	600	9,075	3,691	4,072
Methodist Episcopal, North				
Peking	....	....	3,200	....
Wuhu	....	....	1,500	900
Methodist Episcopal, South				
Soochow	....	1,100	3,000	....
Methodist, South, and American Baptist, (Jointly)				
Huchow	....	....	....	....
American Presbyterian, North				
Changteh	....	825	225	16,594
Chefoo	....	....	1,725	2,250
Hwaiyuen	....	....	....	....
Paotingfu	....	16,160	1,018	9,475
Shuntehfu	....	13,603	....	5,488
Canton Hospital (Union)	....	....	4,500	4,500
Church of Scotland				
Ichang	....	....	....	....
Protestant Episcopal, U.S.A.				
Anking	....	....	....	....
American Presbyterian, South				
Kashing	....	2,553	....	....
Soochow	425	300	3,125	900
United Christian				
Luchowfu	....	536	360	2,992
Nantungchow	....	....	....	603
Southern Baptist Convention				
Chengchow	....	1,350	1,200	900
Hwanghien	....	400	1,050	450
Yangchow	....	550	625	28,575
London Missionary Society				
Tsangchow	....	....	....	750
Medical Mission Auxiliary of London				
Tai Yuan Fu	....	....	....	....

for Hospitals, 1914–1922

1919	1920	1921	1922	Totals
$........	$........	$750	$........	$4,687
....	....	15,000	5,000	20,000
7,893	3,994	5,544	2,127	36,996
....	....	11,250	600	15,050
....	....	4,125	7,326	13,851
600	17,500	13,514	26,213	61,927
....	....	10,000	14,650	24,650
4,838	....	6,225	5,569	34,276
3,491	2,250	4,998	5,700	20,414
750	3,000	1,650	10,163	15,563
7,050	....	3,750	4,575	42,028
2,325	2,400	1,950	1,563	27,329
4,500	10,500	4,500	....	28,500
....	1,125	....	750	1,875
19,800	2,400	7,682	3,525	33,407
....	....	....	....	2,553
900	....	....	....	5,650
13,000	5,000	....	3,382	25,270
3,000	....	....	....	3,603
300	....	....	....	3,750
....	....	....	....	1,900
8,025	....	....	2,000	39,775
....	....	....	....	750
....	1,448	....	1,702	3,150

TABLE 4: *Summary of Expenditures*

	1914 to 1915	1916	1917	1918
A. Mission—*Continued*				
United Free Church of Scotland				
Mukden	....	....	....	$9,000
Nanking University Hospital	....	....	$22,250	21,250
Women's Foreign Missionary Society				
Kiukiang	....	....	....	....
Tientsin	....	....	1,500	....
Hunan-Yale Medical School Hospital				
Kuling Medical Missionary Association Hospital	$1,000	....	....	....
Red Cross Hospital, Shanghai*	....	....	....	....
Loss in Exchange	....	....	....	11,050
Totals	$2,025	$46,452	$48,969	$123,686
B. Chinese				
Central Hospital, Peking	....	....	....	....
Total	....	....	....	....

*See Table II, Harvard Medical School of China.

for Hospitals, 1914–1922—Continued

1919	1920	1921	1922	TOTALS
$750	....	$750	$7,423	$17,923
....	....	9,250	18,500	71,250
158	$342	....	....	500
....	....	....	....	1,500
....	....	....	....	1,000
....	....	19,615	19,505	39,120
50,244	7,981	20,077	321	89,673
$127,624	$57,940	$140,630	$140,594	$687,920
....	$3,000	....	....	$3,000
....	$3,000	....	....	$3,000

TABLE 5: *Summary of Expenditures for Fellowships and Scholarships, 1915–1922*

	1915	1916	1917	1918	1919	1920	1921	1922	Totals
For Study in the United States or Europe...	$10,672	$33,264	$43,315	$51,318	$39,557	$29,081	$24,964	$23,771	$255,942
For Study in Peking and Hongkong									
Foreign...............	......	......	......	......	......	......	1,800	4,412	6,212
Chinese...............	......	......	......	......	......	......	659	2,327	2,986
Totals.............	$10,672	$33,264	$43,315	$51,318	$39,557	$29,081	$27,423	$30,510	$265,140

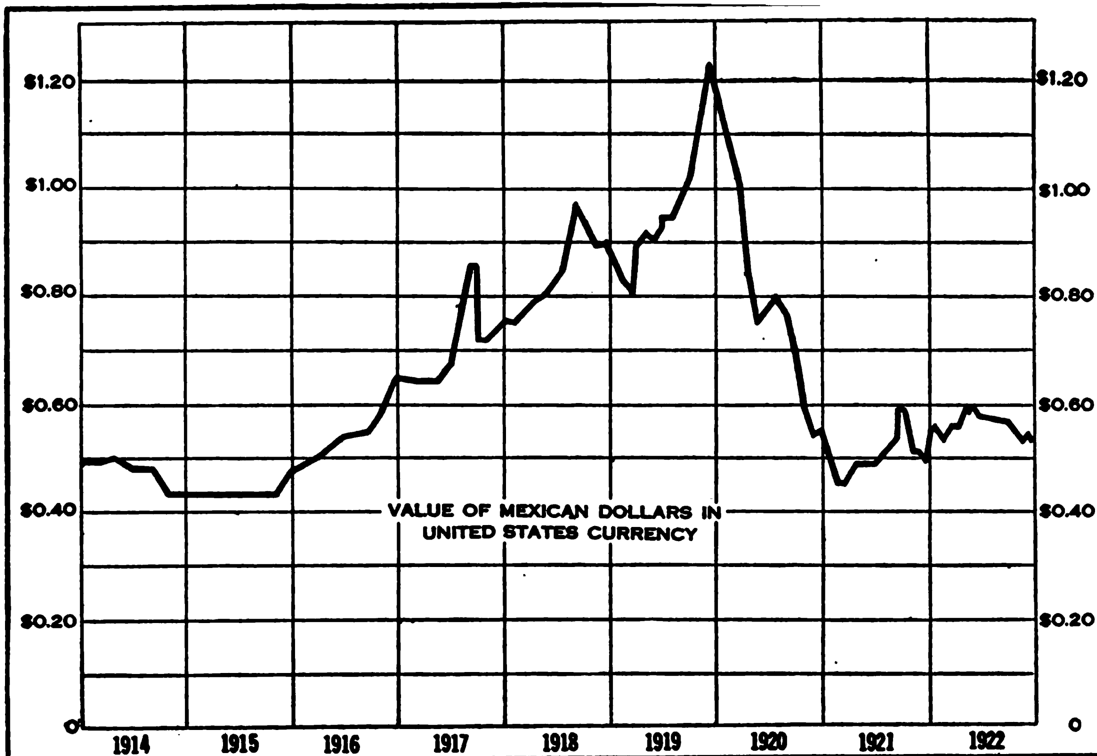


Fig. 82.—Curve showing monthly fluctuation in the value of Chinese silver currency in terms of United States money, 1914–1922

II

STATISTICS CONCERNING MEDICAL SCHOOLS IN CHINA

Name of School	Staff						Students								Graduates	Character of Work				Hospital			
	Faculty			Administrative and Technical Employees			Preparatory		Medical School					Graduate or Special Students	1922	For Men or Women	Language Used in Teaching	Preparatory Course	Length of Medical Course	Number of Beds	Number of Out-patient Visits, 1921–1922		
							Year		Year														
	Full Time	Part Time	Total	Full Time	Part Time	Total	1st	2nd	1st	2nd	3rd	4th	5th								New Visits	Return Visits	Total
Foochow Union Medical College....	4	2	6	1	2	3	..	..	..	..	..	9	6	..	6	Men only	English	None	5 years	152	7,456	4,728	12,184
Hackett Medical College....	12	10	22	3	..	3	8	..	8	..	13	10	8	6	6	Women only	Chinese	1 year	5 years (Including internship)	72 (Some use of other hospitals)	7,651	9,446	17,097
Hunan-Yale Medical College....	18	1	19	6	..	6	17	14	16	4	9	7	9	..	8	Coeducational	English	2 years	5 years	120	7,302	10,281	17,583
Mukden Medical College....	19	5	24	..	..	..	..	..	30	..	..	34	..	..	27	Men only at present	Chinese	None	5 years (from 1923, 6 years)	120	15,535	28,814	44,169

SHANTUNG CHRISTIAN UNIVERSITY MEDICAL SCHOOL.....	23	2	25	3	..	3	28	11	10	25	11	17	12	..	21	Men only	Chinese	2 years	5 years	115	12,525	27,306	39,831
ST. JOHN'S UNIVERSITY MEDICAL SCHOOL.....	17	7	24	..	5	5	..	..	6	3	5	4	13	6	13	Men only	English	2 years	5 years	St. Luke's 155 St. Elizabeth's 110	22,993 15,000	43,143	81,136
WEST CHINA UNION UNIVERSITY MEDICAL SCHOOL.....	5	3 or 4	8	3*	..	3	32	8	7	..	..	1	5	..	5	Men only	Chinese	2 years	5 years	105	5,060	4,070	9,130
NORTH CHINA UNION MEDICAL COLLEGE FOR WOMEN.....	7	8	15	†		..	..	..	..	6	2	5	5	3	5	Women only	Chinese chiefly, some in English	2 years	5 years	65	5,045	15,012	20,057

* University Officers.

† Accounted for in figures given for faculty.

II (*Continued*)

STATISTICS CONCERNING MEDICAL SCHOOLS IN CHINA (*Continued*)

Name of School	Gross Expenditure and Income, 1921–1922								
	Gross Expenditure			Fees and Local Income			Subsidies		
	School	Hospital	Total	School	Hospital	Total	School	Hospital	Total
Foochow Union Medical College	....	....	....	....	....	....	....	....	....
Hackett Medical College........	....	....	$78,564.00	....	....	$47,800.00	....	....	$49,900.00*
Hunan-Yale Medical College....	$90,609.12	$87,667.31	$178,276.43	$1,889.85	$30,308.59	$32,198.44	$88,719.27	$57,358.82	$146,077.99
Mukden Medical College........	£4,920 (Excluding salaries of several professors not directly paid by College)	£3,509	£8,429	£865 (Including Chinese Government grant of £315)	£2,589	£3,454	....	....	....

SHANTUNG CHRISTIAN UNIVERSITY MEDICAL SCHOOL	$38,479.68	$51,635.85	$90,115.53	$2,660.77	$22,896.27	$25,557.04	....	....	$56,809.45†
ST. JOHN'S UNIVERSITY MEDICAL SCHOOL.........	$55,000.00	$82,544.17	$162,544.17	$7,600.00	$77,784.17	$105,384.17	$47,400.00	$4,760.00	$57,160.00‡
	....	25,000.00	....	....	20,000.00	....	....	5,000.00	....
WEST CHINA UNION UNIVERSITY MEDICAL SCHOOL.....	$9,000.00	$16,785.15	$25,785.15	....	$10,463.80	$10,463.80	....	$6,321.35	$6,321.35§
NORTH CHINA UNION MEDICAL COLLEGE FOR WOMEN.....	$23,835.28	$53,742.04 (Not including part time salaries and passage money)	$77,577.32	$2,768.00	$21,226.54	$23,994.54	$23,460.00 (Building operations carried by previous appropriations $22,789).	$13,821.00	$37,281.00

NOTE: These tables were prepared from information courteously supplied by the authorities of the schools concerned. The variation in methods of budgeting and accounting makes comparison of the figures difficult but it is hoped that in later reports an adequate summary will be feasible.

* The finances of Hospital, Medical School, and Nurses' Training School are not divided. Of the expenditures $37,000 was for lands and buildings. Salaries of 11 of the staff were not included in subsidies.

† These figures do not include salaries of teachers paid by missions, estimated at Mex. 60,000.

‡ For St. Elizabeth Hospital only estimates of total income, which is all local except about Mex. 5,000. This also does not include salaries of five foreign nurses at St. Luke's and one at St. Elizabeth.

§ This gross expenditure does not include salaries of teachers, etc., but is the amount spent yearly for the purchase of supplies and apparatus.

III

PUBLICATIONS OF STAFF MEMBERS PEKING UNION MEDICAL COLLEGE, 1922

The preparation and use of Dakin's Solution; by A. S. Taylor and T. Tuffier. *Addresses and Papers*, September, 1921.

Present-day aspects of parasitology in China; by E. C. Faust. *Addresses and Papers*, September, 1921.

Tuberculosis; by J. H. Korns. *Addresses and Papers*, September, 1921.

The new viewpoint in pharmacology; by B. E. Read. *China Medical Journal*, v. 35, pp. 567–574.

Taoist ideas of human anatomy; by E. V. Cowdry. *Annals of Medical History*, v. 3, pp. 301–309, 16 figs.

Phases in the life history of a Holostome, *Cyathocotyle orientalis* Nov. Spec., with Notes on the Excretory System of the Larva; by E. C. Faust. *Journal of Parasitology*, v. 8, pp. 78–85, 4 figs.

Hole in the macular region of both eyes due to simultaneous injury; by T. M. Li. *American Journal of Ophthalmology*, v. 5, pp. 1–4, 1 pl., 3 figs.

Experiments on the transplantation of limbs in Amphibia. Further observations on peripheral nerve connections; by S. R. Detwiler. *Journal of Experimental Zoology*, v. 35, pp. 115–161, 32 figs.

Occipital lobe embolism; by A. H. Woods. *Journal of Nervous and Mental Disease*, v. 55, pp. 81–90, 3 figs.

Separate analyses of the corpuscles and the plasma; by Hsien Wu. *Journal of Biological Chemistry*, v. 51, pp. 21–31.

A new colorimetric method for the determination of plasma proteins; by Hsien Wu. *Journal of Biological Chemistry*, v. 51, pp. 33–39.

Epithelioma; by F. L. Meleney. *China Medical Journal*, v. 36, pp. 93–102, 12 figs.

Trachoma in China; by T. M. Li. *National Medical Journal of China*, v. 8, pp. 1–10.

The drainage of mastoids as a means of preventing "scarlet fever ear"; by A. M. Dunlap. *Laryngoscope*, v. 32, pp. 272–274.

The motor nuclei of the cerebral nerves in phylogeny. A study of the phenomena of neurobiotaxis; by D. Black. *Journal of Comparative Neurology*, v. 34, pp. 233–275, 16 figs.

Types of cerebro-spinal syphilis in China; by A. H. Woods. *China Medical Journal*, v. 36, pp. 206–215.

On an anomalous digastric muscle in the thigh of a Chinese; by P. H. Stevenson. *Anatomical Record*, v. 23, pp. 281–290, 1 fig.

A survey of the helminth parasites of man in North China; by E. C. Faust. Extract, *Transactions 4th Congress Far Eastern Ass'n Trop. Med.*, 6 pp.

A slide rule for computing and converting chinese dates and ages; by P. H. Stevenson. *China Medical Journal*, v. 36, pp. 327–329, 2 figs.

Notes on the excretory system in *Aspidogaster conchicola;* by E. C. Faust. *Transactions of the American Microscopical Society*, v. 41, pp. 113–117, 2 pl.

Odor from healing mastoid wounds simulating that from necrosing bone associated with secondary invasion of diphtheroids; by A. M. Dunlap. *Laryngoscope*, v. 32, pp. 616–618.

Syncytioma (atypical chorioma) of the uterus terminated by acute peritonitis; by H. E. Meleney. *Surgery, Gynecology, and Obstetrics*, v. 35, pp. 137–141, 10 figs.

The tetanus bacillus as an intestinal saprophyte in man; by C. Ten Broeck and J. H. Bauer. *Journal of Experimental Medicine*, v. 36, pp. 261–271.

Bronchospirochetosis in China; by E. C. Faust. *Archives of Internal Medicine*, v. 30, pp. 343–354, 3 charts.

Notes on *Embadomonas Sinensis*, Faust and Wassell, 1921; by E. C. Faust. *Journal of Parasitology*, v. 9, pp. 33–34, 1 pl.

Streptococcus hemolyticus mastoiditis; by A. M. Dunlap. *Laryngoscope*, v. 32, pp. 733–762.

Thrombosis of the superior petrosal sinus and meningitis, following acute mastoiditis; by H. E. Meleney. *Laryngoscope*, v. 32, pp. 763–767.

Some observations on experimental tetany; by E. W. H. Cruickshank. *China Medical Journal*, v. 36, pp. 445–468, 3 figs.

A marker for identifying right and left eye images in stereoscopic chest films; by P. C. Hodges. *American Journal of Roentgenology*, v. 9, pp. 751–752, 2 figs.

A metastisizing malignant tumor of the thyroid gland; by F. L. Meleney. *Annals of Surgery*, v. 76, pp. 684–694, 9 figs.

Studies on hemoglobin. I. The advantage of alkaline solutions for colorimetric determination of hemoglobins; by Hsien Wu. *Journal of Biochemistry*, v. 2, pp. 173–180.

NOTE: This list does not include papers presented at the opening exercises by persons not on the staff, although published by the College in 1922. The contribution of a visiting professor, which was also published by the College in 1922, is not included.

DIVISION OF MEDICAL EDUCATION

Report of the General Director

To the President of the Rockefeller Foundation:

Sir:

I have the honor to submit herewith my report as General Director of the Division of Medical Education for the period January 1, 1922, to December 31, 1922.

Respectfully yours,
RICHARD M. PEARCE,
General Director

DIVISION OF MEDICAL EDUCATION

The work of the Division of Medical Education during the year 1922 may be described under two headings: (1) new undertakings, and (2) a progress report on programs inaugurated in previous years.

I. New Work

Study of Conditions in Medical Schools of Central Europe

In October, November, and December, the Director visited Germany, Austria, Hungary, Czechoslovakia, and Poland in order to obtain exact knowledge concerning medical institutions and personnel, the condition of laboratory equipment and supplies, and the facilities for training men. In general it was found that institutes and clinics liberally equipped before the War had used up their stocks, and that fixed apparatus, as a result of general wear and tear, was in need of replacement. The high cost of supplies and animals endangered research, and the difficulties of exchange and the heightened cost of living had led to a decrease in the number of men entering on scientific careers. The regular staffs on salary were as a rule, however, complete, and men were awaiting appointment provided they could re-

ceive compensation. In all the countries mentioned the conditions were practically the same, but there was some evidence of a slight, gradual improvement in Austria, largely due to the stabilization of currency and the hope of relief in the Government's attempt to balance its budget on the basis of the Geneva Convention Loan. In some countries, as Poland, Czechoslovakia, and Hungary, the situation has been complicated by the establishment of new medical schools, and the necessity of finding for these not only faculty, but also equipment and supplies.

In Austria, Czechoslovakia, and Hungary the Foundation has since 1920 been aiding institutions through supplies for laboratory equipment.

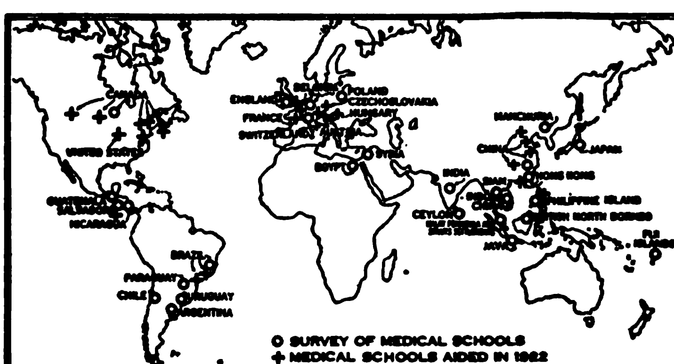


Fig. 83.—Activities of the Division of Medical Education. On this map are shown (1) the countries in which surveys of medical education have been made by representatives of the Foundation up to the end of 1922, and (2) the location of medical schools aided during 1922

As a result of the present survey this aid has been increased in the countries mentioned and is to be extended to Germany and Poland. In addition, the system of traveling fellowships for foreign study has been extended to all surveyed countries in the hope of allowing properly equipped men to continue their studies under more favorable conditions in other countries of Europe or in America. A new form of emergency aid has also been established in all these countries—that of resident fellowships, the essential principle of which is the granting of relatively small sums to cover the expense of living and research so that younger men desiring to enter upon a scientific career, or older men already in service but who need assistance, may be given adequate opportunity for good training. This plan will be in operation in 1923. In Germany resident fellowships will be assigned by a local committee composed of Professor M. Matthes, University of Königsberg, Professor Max von Frey, University of Würzburg, Professor Versé, University of Marburg, and Professor Heinrich Poll, University of Berlin (secretary). With this committee serves a representative of the Notgemeinschaft der Deutschen Wissenschaft, the emergency committee appointed by the Government to aid in the support of scientific work, and also (as chairman) the Director of the European

Office of the Division of Medical Education of the Rockefeller Foundation. In the other countries named local committees are being appointed to co-operate with the European Director in handling all problems concerning laboratory supplies and fellowships.

The chief object of this emergency support is to insure a succession of well-trained men in the medical sciences in each of these countries.

Teaching Methods in England

As a result of the mutual interest in teaching methods in America and England it seemed advisable for the Foundation to support a study of the methods of instruction in the clinics and dispensaries in the English medical schools. The adoption in England of what is there called the "unit" system and in the United States the "full-time" system of instruction in clinical medicine lent further interest to such a study. A survey was made in October and November by Drs. David L. Edsall, of the Harvard Medical School, and Evarts A. Graham, of Washington University.

University of Hongkong

In 1921 the Director studied the medical school of the University of Hongkong, with particular reference to the development of strong medical

teaching centers in the Far East. As a result the Foundation agreed to endow chairs in medicine, surgery, and obstetrics, with the understanding that such assistance would aid the local authorities in bringing about certain improvements in the general situation. These changes included (1) appointment of incumbents of these chairs on a university basis, (2) separation of the chairs of surgery and anatomy, (3) development of the department of pathology to the same level and importance as the departments of anatomy and physiology, and (4) full-time assistants for anatomy, physiology, and pathology; (5) development of a library for the medical school; (6) provision of salary and quarters for an assistant and a resident house man in the Civil Hospital for each of the three clinics of surgery, medicine, and obstetrics; and (7) other improvements in the outpatient and clinical laboratory facilities.

The changes in regard to obstetrics were not considered immediately feasible by the university authorities, but the chair of surgery has been filled by the appointment of Dr. Kenelm H. Digby, formerly professor of surgery and anatomy in the same institution, and the chair of medicine by the appointment of Dr. John Anderson, from the London School of Tropical Medicine. The sum of 500,000 Hongkong dollars has been paid to the University for the endowment of

these two chairs. It is hoped that the department of obstetrics also may be developed in the near future.

Royal Medical College of Bangkok, Siam

In line with the development of important centers in the Far East, and following the survey made by the Director in 1921, the Foundation on December 6, 1922, agreed to assist the government of Siam during a period of five years in reorganizing the Royal Medical College of Bangkok. As a result of this assistance the Government will (1) provide an extension of facilities for secondary education; (2) reorganize the school of arts and sciences in Chulalongkorn University so as to provide a satisfactory two-year premedical course; (3) establish a medical course of four years with full-time professors to head six major departments (anatomy, physiology, pathology, medicine, surgery, obstetrics); (4) increase substantially salaries of graduates of the reorganized medical school who enter government service; (5) erect a pathological laboratory, new wards, and an administration building. The Foundation agrees (1) to select foreign professors for temporary appointment in charge of the six major departments and to provide remuneration as may be necessary in addition to the maximum salary paid by the Siamese

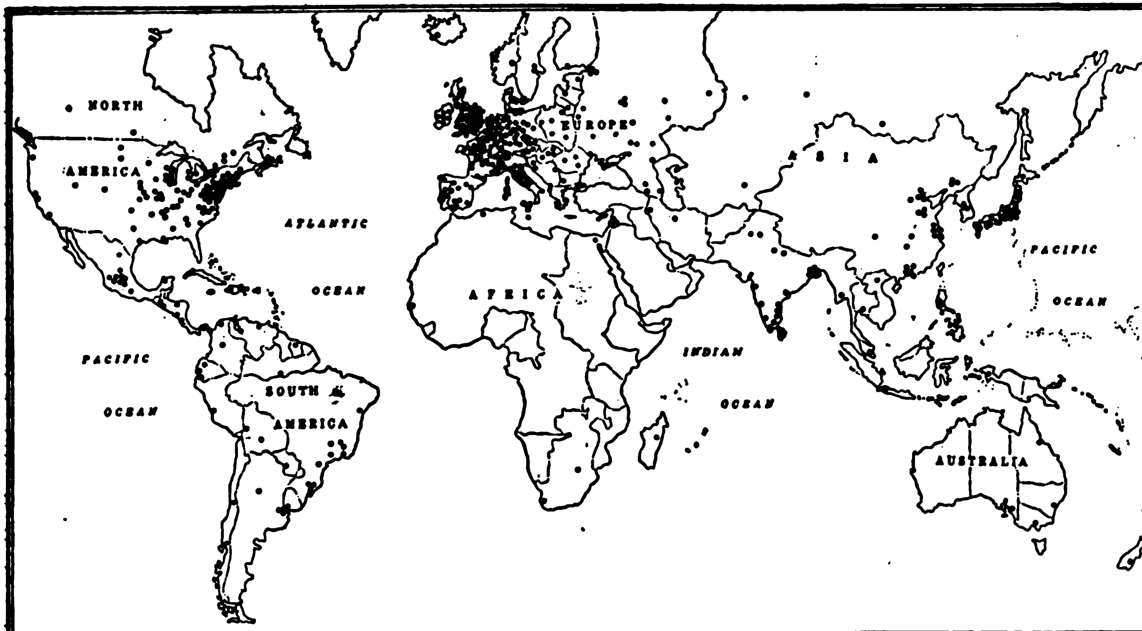


Fig. 84.—Geographical distribution of the medical schools of the world. Note the concentration of facilities for medical training in Western Europe, Japan, and the eastern part of the United States. Many populous countries are practically without modern medical schools

government; (2) to assist, through fellowship grants, in the training of Siamese who are to succeed the temporary foreign professors; and (3) to furnish $125,000 to be used in building laboratories of physiology and anatomy and a surgical building containing operating rooms, offices, and laboratories.

Medical School of the University of the Philippines

At the request of the government of the Philippines, the Division of Medical Education secured Dr. William S. Carter, formerly dean and professor of physiology of the medical school of the University of Texas, to act as associate dean of the College of Medicine and Surgery of the University of the Philippines, and to advise the faculty on the development of this school. Dr. Carter went to Manila in March, 1922, and has since been acting professor in the department of physiology and has advised with the dean of the school, Dr. Calderon, on matters of educational policy.

Very important changes have taken place during the year in the medical school of the University of the Philippines. The curriculum has been modified to emphasize laboratory courses and to increase the amount of obligatory clinical training, the budget system has been rearranged, a survey has been made of the cause

of students' failures in premedical and medical courses, and reorganization of the resident staff of the Philippine General Hospital has been brought about.

Faculdade de Medicina e Cirurgia, São Paulo, Brazil

As the result of a survey made in February and March at the invitation of the Faculdade de Medicina e Cirurgia de São Paulo by the Director of the Division of Medical Education and the Director of Public Health Laboratory Service of the International Health Board, the Foundation on May 24, 1922, decided to assist in the reorganization of this school on general lines, as follows: Concentration of all activities of the medical school at one site, including a hospital of at least three hundred beds under the professional control of the faculty of the school; new laboratory buildings for (1) anatomy, histology, and medical biology, (2) physiology, pharmacology, and physics, (3) chemistry, including inorganic, organic, and biological chemistry, (4) pathology and bacteriology, and (5) hygiene; limitation of students to correspond to the amount of equipment for individual class work in the medical sciences; development of the departments of anatomy, physiology, biochemistry, pathology, bacteriology, and hygiene, with a

full-time professor in charge and at least one other full-time person in each department, with increased budgets for salaries and maintenance, the curriculum to be changed to increase the time given to laboratory instruction; increased power for the faculty in determining appointments to its membership; recognition of the school by the Government. If the reorganization outlined were put into effect, the Foundation agreed (1) to provide 4,000 contos (approximately $480,000 at the rate of exchange on December 31, 1922) for the erection of the five laboratory buildings mentioned, with the understanding that the Government would increase the annual budget of the medical school by 200 contos for maintenance of the laboratories; (2) to invite a commission composed of members of the faculty of the São Paulo school, with the possible addition of an architect, to visit the United States and other countries as guests of the Foundation to study hospital and laboratory construction and administration and methods of laboratory and clinical teaching; (3) to provide fellowships for men appointed by the Faculdade; and (4) if requested by the Faculdade, to stand ready to send one or more professors from the United States or Europe to assist in organizing the work temporarily.

Medical School of University of Salvador

On the invitation of the University of Salvador Dr. Robert A. Lambert, of Yale, was sent to that institution, where, in co-operation with the local faculty, he delivered a series of lectures on pathology and conducted practical demonstrations. In addition he studied the general problem of medical education in Central American countries.

National Research Council Fellowships in Medicine

There is commonly a critical period in the career of a young man who is fitting himself to become a teacher or investigator in the medical sciences. This period falls at the time of or shortly after his graduation from the medical school when he is obliged to choose between the practice of medicine or the continuance of studies in the field of his choice. The graduate is usually between twenty-six and thirty years of age, and in many cases has assumed financial obligations which have a considerable influence in discouraging him from continuing his studies unless he can secure an adequate income. Large numbers of men who are really more interested in some one of the medical sciences than they are in the practice of medicine are obliged, from economic causes, to desert the ranks of teaching and re-

search in order to gain a livelihood during this especially difficult period in their lives.

In order to encourage competent workers who would otherwise be obliged to forsake careers of teaching and investigation, the Rockefeller Foundation, in co-operation with the General Education Board, offered to the National Research Council the sum of $100,000 yearly for a period of five years. The administration of the fund is under a committee composed of the Chairman of the Division of Medical Sciences of the National Research Council as chairman *ex officio*, and the following members appointed by the National Research Council: Drs. David L. Edsall, Joseph Erlanger, G. Carl Huber, Edwin O. Jordan, Dean Lewis, W. G. MacCallum, Lafayette Mendel, and W. W. Palmer. In this initial year grants amounting to $56,200 were made to twenty-six fellows—five in the fields of pathology and bacteriology, five in medicine, six in surgery, four in physiology, two in biochemistry, and one each in anatomy, medical specialties, pharmacology, and physical chemistry.

State University of Iowa College of Medicine

The General Education Board and the Rockefeller Foundation have authorized a contribution of one half of a total of $4,500,000 required by

Fig. 85.—Map showing location of European cities to which English and American scientific journals were sent in 1922 for the use of 216 medical libraries

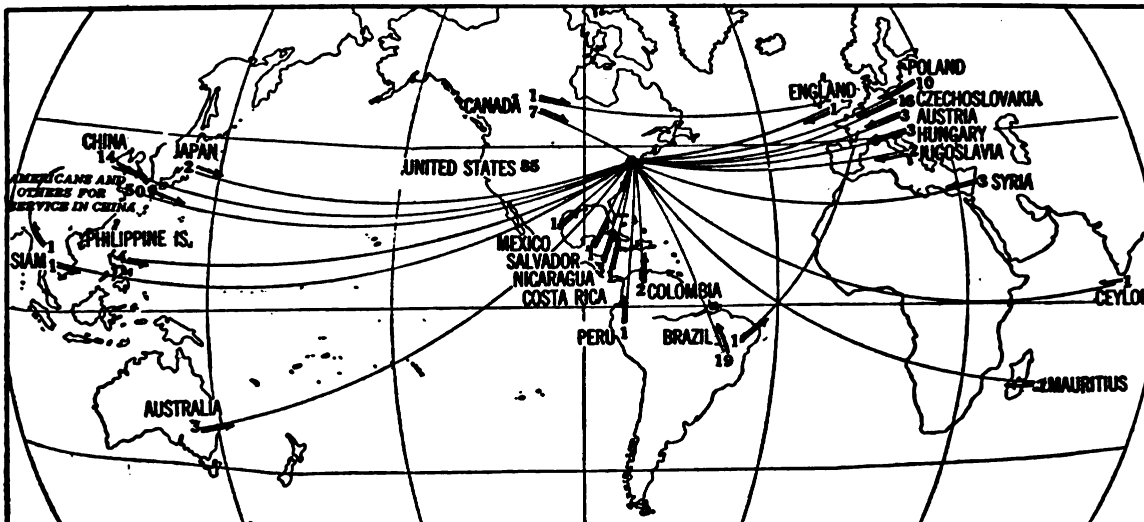


Fig. 86.—Fellowships for twenty-three countries. Through its fellowship plan the Foundation provides for both men and women an opportunity for study in the United States and other countries to fit them for leadership and technical efficiency. These fellowships promise to be one of the most important means of promoting international co-operation in preventive medicine and medical education

the State University of Iowa College of Medicine for building and equipment. The gift of $1,125,000 from the General Education Board and of a like amount from the Rockefeller Foundation is contingent on the appropriation[1] by the state of Iowa of the remaining $2,250,000 necessary to make up the total of $4,500,000.

Medical Information Service

Increased demands from many parts of the world have come to the Division of Medical Education for information in regard to hospital plans, methods of instruction, curricula, and general theory of medical education. To meet these requests, school and hospital plans, catalogs, reports on medical education, etc., are being formed into collections of documents on educational theory, experiment, and practice throughout the world from which will be prepared later bulletins of value to medical teachers.

II. Progress of Earlier Undertakings

Medical Literature and Laboratory Supplies

The policy of furnishing medical literature to important centers in low-exchange countries of Europe has been continued. During the year books and about 1,500 subscriptions to British and American medical journals were sent to

[1] The bill to accept the provisions of this gift passed both houses of the General Assembly of Iowa in March, 1923.

over two hundred medical libraries in Europe. In Germany the distribution of this literature has been placed in the hands of the Notgemeinschaft der Deutschen Wissenschaft, but in other countries it is handled by local committees. The wide use and great appreciation of this material, in many instances the only medical literature available in English, has justified the continuation and extension of this service.

In the same way the assistance in procuring laboratory equipment, which was begun in 1920 in Austria, Czechoslovakia, and Hungary, is to be extended to other low-exchange countries and the principle broadened to include cost of animals and their maintenance, and important services in connection with teaching facilities.

Pasteur Institute

Continuing the policy of assisting the Pasteur Institute of Paris, which exerts a fundamental influence on French medical education through training advanced investigators in the medical sciences, the Rockefeller Foundation appropriated the sum of $25,000 to this Institute for work during 1922.

Free University of Brussels

The Brussels authorities have cleared of buildings the site proposed for the new medical school,

and have had plans drawn for both medical school and hospital. It is anticipated that the construction of both these buildings will begin during the year 1923.

University College and University College Hospital Medical School, London

The building of the new Institute of Anatomy, University College, is approaching completion, and will be dedicated in the late spring of 1923,[1] while construction has begun in connection with the new buildings of the medical school. Final payments on the Foundation's pledge for endowment of this important medical center were made in 1922.

Visiting Commissions

A group of professors from the Faculty of Medicine of the University of Strasbourg, France, visited medical schools and institutions of the United States and Canada from October 1 to 21, 1922. The Commission was composed of the following:

Dr. Georges Weiss, Dean, and Professor of Biophysics.
Dr. Léon Blum, Professor of Clinical Medicine.
Dr. Paul Bouin, Professor of Histology.
Dr. Camille Duverger, Professor of Ophthalmology.
Dr. P. Masson, Professor of Pathological Anatomy.
Dr. Maurice Nicloux, Professor of Physiological Chemistry.
Dr. Lucien Pautrier, Professor of Dermatology.

[1] Dedicated May 31, 1923.

Special attention was paid by the Commission to the organization of medical teaching in the United States. On its return to Europe the Commission spent two weeks in England. Both in England and in the United States the visit resulted in a mutual exchange of ideas and information, stimulating and valuable to medical men of all three countries.

On May 30, 1922, the Rockefeller Foundation, through the Japanese Ambassador at Washington, extended an invitation to the Japanese Government to send a Commission to visit the United States as guests of the Foundation to study medical institutions and public health administration. This invitation was accepted and the visit planned for the spring of 1923.

Fellowships

Fellowships under the Division of Medical Education are limited to candidates who are assured of teaching positions upon the conclusion of their studies, and preference has been given to men in institutions with which the Foundation has definite programs of co-operation. The sixteen fellows under direct charge of the Division of Medical Education during 1922, not including the medical fellows under the National Research Council, came from the following countries: Brazil, 5; Canada, 3; England, 1;

Japan, 2; Jugoslavia, 2; Syria, 3. The distribution of these fellowships according to field of work was as follows:

Anatomy	3
Bacteriology and Immunology	1
Gynecology	1
Internal medicine	1
Oral surgery	1
Pathology	3
Physiological chemistry	4
Physiology	1
Surgery	1
	16

Canadian Schools

During the year 1922, the program of assistance for the schools in Canada, adopted in 1920, was continued. To the Faculty of Medicine of Dalhousie University $50,000 appropriated in 1921 was paid for the improvement of clinical facilities, principally in obstetrics, at the new Salvation Army Hospital. The Université de Montréal received a grant of $25,000 for the development of laboratory teaching in the premedical and medical departments. The University of Toronto received $50,000 interest on the pledge of $1,000,000 endowment. The University of Manitoba on May 8 received payment of the entire pledge of $500,000, with interest from January 1, for general endowment. At Alberta the development of the clinical branches was aided by a grant of $25,000 for the year.

THE ROCKEFELLER FOUNDATION

Report of the Treasurer

NEW YORK, DECEMBER 31, 1922

To the President of the Rockefeller Foundation:

Sir:

I have the honor to submit herewith my report of the financial operations of The Rockefeller Foundation and its subsidiary organizations for the period January 1, 1922, to December 31, 1922.

Respectfully yours,
L. G. MYERS,
Treasurer.

TREASURER'S REPORT

The following table summarizes the situation with respect to income, disbursements, and appropriations:

Undisbursed income on hand January 1, 1922, amounted to	$7,359,000.90
Refunds on account of payments in 1921 and prior years amounted to	6,960.41
Income from January 1, 1922, to December 31, 1922, amounted to	8,836,309.55
The total amount available for disbursement was, therefore	$16,202,270.86
Disbursements on account of appropriations (not including a payment of $6,000,000 to Johns Hopkins University made from principal funds) amount to	9,911,408.78
Leaving a balance of undisbursed income on December 31, 1922, amounting to	$6,290,862.08
Unpaid appropriations and commitments effective in 1922 and prior years amount to	4,377,426.74
Leaving a balance in income account available for appropriation amounting to	$1,913,435.34

Appropriations and pledges effective in 1923 and following years, amounting to $15,609,869.22, as shown in the annexed balance sheet, are not provided for in the foregoing figures but are considered as charges against the income of the years in which they fall due.

In addition to the payments mentioned in the foregoing summary, the sum of $6,000,000 was appropriated and paid from principal.

The Foundation has heretofore carried its investments at their purchase price, or, in the case of those received from Mr. Rockefeller, at an appraised valuation based upon their market value when the several gifts were received.

As securities have been redeemed or sold from time to time, any difference between the price received and the ledger value has been credited or debited, as the case happened to be, to a reserve fund. The net result of this has been a credit balance. As this plan has affected only securities actually disposed of, no change has heretofore been made in the valuation of other securities that have depreciated in market, and, in the judgment of the Finance Committee, in asset values.

The Finance Committee came to believe that in the case of a number of issues the recovery of this depreciation was more or less uncertain, and decided to recommend to the Trustees the adoption of the long-established commercial and fiduciary practice of readjusting, from time to time, the valuations of depreciated securities.

This recommendation was adopted by the Trustees, who authorized the modification of the original plan and directed that the net sum received from the sale and redemption of securities in excess of their ledger valuation, together with the balance to the credit of the reserve fund on December 31, 1921, be used to reduce the ledger valuations of securities on which substantial depreciation had taken place. These instructions have been carried out.

Since the close of the year the accounts of the Comptroller, the accounts of the Treasurer and the securities owned by the Corporation have been examined by Messrs. Townsend, Dix and Pogson, Accountants, who have rendered a report to the Chairman.

The financial condition and operations are set forth in the appended exhibits listed below:

Balance Sheet........................ Exhibit A
Statements of Receipts and Disbursements of Income.................. Exhibit B

EXHIBIT A

BALANCE SHEET, DECEMBER 31, 1922

ASSETS

I. INVESTMENTS			
General Fund			
General Schedule (Exhibit P)		$161,573,215.10	
Secured demand loans		3,631,409.40	
			$165,204,624.50
Special Funds (Exhibit Q)			116,800.00
			$165,321,424.50
II. LAND, BUILDINGS, AND EQUIPMENT (Exhibit O)			
In China		$8,850,106.00	
In New York		39,326.26	
			$8,889,432.26
III. INCOME ACCOUNTS			
Special Funds			
Cash on deposit in New York			$6,771.65
General Fund			
Cash on deposit in New York		$2,326,847.12	
Cash in London		222,290.93	
Cash in Brussels		233,542.58	
Cash in Czechoslovakia		361,533.38	
Secured demand loans		1,368,590.60	
Funds in hands of agents, to be accounted for, and sundry accounts receivable	$1,784,548.03		
Less accounts payable	6,490.56		
		1,778,057.47	
TOTAL		$6,290,862.08	
Excess of appropriations and pledges over income available		13,696,433.88	
			19,987,295.96
			$19,994,067.61
GRAND TOTAL			$194,204,924.37

EXHIBIT A

BALANCE SHEET, DECEMBER 31, 1922

FUNDS AND OBLIGATIONS

I. FUNDS			
General Fund (Exhibit N)			$165,204,624.50
Special Funds			
Gift of Laura S. Rockefeller		$49,300.00	
Gift of John D. Rockefeller		37,000.00	
Henry Sturgis Grew Memorial Fund		25,000.00	
Arthur Theodore Lyman Endowment		5,500.00	
			116,800.00
			$165,321,424.50
II. LAND, BUILDINGS, AND EQUIPMENT FUND			
Appropriations from income (Exhibit O)			$8,889,432.26
III. INCOME ACCOUNTS			
Special Funds			
Estate Laura S. Rockefeller Fund (Exhibit B)		$64.77	
Henry Sturgis Grew Memorial Fund Income (Exhibit B)		5,665.54	
Arthur Theodore Lyman Endowment Fund Income (Exhibit B)		1,041.34	
			$6,771.65
General Fund			
Balance due on appropriations payable in 1922 and prior years (Exhibit L)		$4,377,426.74	
Appropriations and pledges effective in 1923 and following years:			
1923	$9,717,520.72		
1924	2,683,932.50		
1925	1,131,846.50		
1926	1,941,309.50		
1927	135,260.00		
		15,609,869.22	
			*19,987,295.96
			$19,994,067.61
GRAND TOTAL			$194,204,924.37

* The total of all unpaid appropriations and pledges is $13,696,433.88 in excess of the balance of general fund income amounting to $6,290,862.08, as shown on opposite page, but it will be noted that these obligations become effective over a term of years, thus permitting their satisfaction gradually as the income of the respective years is received.

EXHIBIT B

STATEMENT OF RECEIPTS AND DISBURSEMENTS OF INCOME

GENERAL FUND

Receipts

Balance, December 31, 1921			$7,359,000.90	
Refunds of payments made in prior years				
The Rockefeller Foundation		$5,544.10		
International Health Board		127.49		
China Medical Board		1,288.82		
			6,960.41	
				$7,365,961.31
Income for the year				8,836,309.55
				$16,202,270.86

Disbursements

International Health Board (Exhibit J)				
Hookworm, county health work, malaria, and yellow fever		$717,607.41		
Tuberculosis in France		230,197.72		
Public health education and fellowships		154,249.61		
Miscellaneous		569,410.26		
Administration		170,911.80		
			$1,842,376.80	
China Medical Board (Exhibit K)				
Medical education				
Peking Union Medical College				
Buildings and equipment	$219,741.09			
Operation	623,943.83			
Unaffiliated medical schools	15,483.76			
		$859,168.68		
Premedical education		45,605.00		
Hospitals and premedical education		29,258.34		

Hospitals—Mission and Chinese	121,088.20		
Translation of medical and nursing textbooks	4,413.79		
Fellowships and scholarships	30,510.42		
Miscellaneous	1,567.54		
Administration	115,302.49		
		1,206,914.46	
MEDICAL EDUCATION (Exhibit C)		4,896,216.70	
SCHOOLS OF HYGIENE AND PUBLIC HEALTH (Exhibit D)		1,374,151.85	
BIOLOGY, PHYSICS, AND CHEMISTRY (Exhibit E)		110,174.27	
HOSPITAL, DISPENSARY, AND NURSING STUDIES AND DEMONSTRATIONS (Exhibit F)		141,657.05	
PUBLIC HEALTH EDUCATION AND DEMONSTRATIONS—miscellaneous (Exhibit G)		40,695.62	
MENTAL HYGIENE (Exhibit H)		64,083.55	
MISCELLANEOUS (Exhibit I)		66,096.31	
ADMINISTRATION (Exhibit I)		169,042.17	
			9,911,408.78
Income on hand December 31, 1922			$6,290,862.08
Income on hand December 31, 1922, is accounted for as follows			
Cash in New York		$2,326,847.12	
Cash in London		222,290.93	
Cash in Brussels		233,542.58	
Cash in Czechoslovakia		361,533.38	
Secured demand loans		1,368,590.60	
Funds in hands of agents, to be accounted for, and sundry accounts receivable	$1,784,548.03		
Less accounts payable	6,490.56		
		1,778,057.47	
			$6,290,862.08

EXHIBIT B—*Continued*

SPECIAL FUNDS

LAURA S. ROCKEFELLER FUNDS

Income collected during the year ending December 31, 1922	$3,000.00
Amounts paid to the several societies designated by Mrs. Rockefeller	3,000.00

JOHN D. ROCKEFELLER FUND

Income collected during the year ending December 31, 1922	$1,850.00
Amounts paid to the several societies designated by Mr. Rockefeller	1,850.00

ESTATE LAURA S. ROCKEFELLER FUND

Balance of income December 31, 1922, accounted for in cash on deposit	$64.77

HENRY STURGIS GREW MEMORIAL FUND

Balance December 31, 1921	$4,082.95
Income collected during the year ending December 31, 1922	1,582.59
Accounted for in cash on deposit	$5,665.54

ARTHUR THEODORE LYMAN ENDOWMENT

Balance December 31, 1921	$714.48
Income collected during the year ending December 31, 1922	326.86
Accounted for in cash on deposit	$1,041.34

1922 FOUNDATION APPROPRIATIONS

BALANCES OF APPROPRIATIONS MADE IN PRIOR YEARS AND PAYMENTS THEREON MADE IN 1922

EXHIBIT C

MEDICAL EDUCATION

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
Austria, Hungary, Poland, Czechoslovakia, and Jugoslavia			
To co-operate with the medical schools of the Universities of Vienna, Prague, Innsbruck, Budapest, and Gratz, in the rehabilitation of their scientific equipment for teaching and research (R.F. 2495, 2581)*	$121,375.96	$........	$53,986.12
Belgium			
University of Brussels. Toward building and equipment of the new University Institutes, Francs 6,700,000 (R.F. 2668)	....	500,000.00	....
Expenses of visit to England and the United States of representatives of the University of Brussels (R.F. 2577)	1,203.20	....	279.46
Brazil			
Oswaldo Cruz Institute, Rio de Janeiro. For extending its work in pathology (R.F. 2485, 2641, 2642)	868.87	3,500.00	1,935.10
Faculdade de Medicina e Cirurgia, São Paulo. For scientific equipment and assistants for Department of Pathology (R.F. 2569, 2650)	3,090.79	5,000.00	5,106.99
Faculdade de Medicina e Cirurgia, São Paulo. To supplement salary of professor of pathology, 1921 and 1922 (R.F. 2589)	7,471.81	....	6,785.76
Study of Medical Education in Brazil, 1922 (R.F. 2630)	....	3,000.00	998.15

* The figures in parentheses, following the text describing the purpose of each appropriation, are the serial numbers of the resolution of the Board or Executive Committee, authorising the payment.

EXHIBIT C—*Continued*

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
Canada			
University of Alberta. Development of work in clinical branches (R.F. 2582, 2655)	$12,500.00	$25,000.00	$25,000.00
Dalhousie University. Improvement of clinical facilities (R.F. 2571)	50,000.00	....	50,000.00
University of Manitoba			
Interest on pledge of $500,000 for general endowment (R.F. 2602)	....	25,000.00	8,784.24
General endowment of its Faculty of Medicine (R.F. 2640)	....	500,000.00	500,000.00
Université de Montréal, Faculty of Medicine. Development of laboratories (R.F. 2580, 2656)	12,500.00	25,000.00	25,000.00
University of Toronto. Current expenses of its Department of Medicine (R.F. 2567, 2657)	25,000.00	50,000.00	50,000.00
England			
University College			
Toward building and equipment program £100,000 (R.F. 2624, 2637, 2659)	212,500.00	246,000.00	439,343.75
Interest on pledge of £180,000 for general endowment (R.F. 2599)	....	36,000.00	19,774.11
General endowment £180,000 (R.F. 2653)	....	810,000.00	803,559.38
University College Hospital			
Toward building and equipment program £100,000 (R.F. 2670)	....	440,000.00	440,000.00
Interest on pledge of £435,000 for general endowment (R.F. 2600)	....	87,000.00	66,812.88
General endowment £435,000 (R.F. 2654, 2661, 2662)	....	1,965,400.00	1,919,803.13
Study of English methods of clinical instruction (R.F. 2631)	....	7,000.00	2,725.74
France			
Pasteur Institute. Toward its work during 1922 (R.F. 2636)	....	25,000.00	25,000.00
Expenses of visit to England and the United States of representatives of the University of Strasbourg (R.F. 2644)	....	10,000.00	8,676.84

Hongkong			
University of Hongkong. Endowment of chairs in medicine and surgery, Hongkong dollars 500,000 (R.F. 2647)	....	320,000.00	293,750.00
Jugoslavia			
Expenses of visit to the United States of representatives of the Belgrade Medical School (R.F. 2576)	2,982.07	....	2,978.09
Philippine Islands			
University of the Philippines			
Salary of associate dean of its medical school during 1922, and traveling expenses of himself and family from his home to the Philippines (R.F. 2633)	....	8,500.00	8,081.47
Expenses of associate dean of its medical school in connection with his visit to the Peking Union Medical College (R.F. 2665)	....	500.00	....
Salvador			
Expenses of visiting pathologist to the Medical School of Salvador University (R.F. 2658)	....	1,500.00	936.03
United States			
University of Chicago Medical School. Interest on pledge of $1,000,000 (R. F. 2515, 2603)	10,085.61	50,000.00	47,705.49
Miscellaneous			
Survey of medical schools in Europe (R.F. 2651)	....	17,500.00	3,495.07
Supplying the chief medical centers of Europe with important medical journals of America and England (R.F. 2584, 2626, 2649)	27,891.36	20,000.00	24,322.04
Expenses of visit to the Peking Union Medical College of scientists from Japan (R.F. 2660)	....	500.00	201.92
American Medical Association			
Toward loss in publishing a Spanish edition of the Journal of the American Medical Association (R.F. 2634)	....	7,782.37	7,782.37

EXHIBIT C—*Continued*

		Prior Appropriations	1922 Appropriations	1922 Payments
Fellowships				
Grants to doctors for medical study (R.F. 2605, 2606, 2607)		$........	$56,000.00	$21,688.54
National Research Council				
Research fellowships in medicine supported jointly by the Foundation and the General Education Board (R.F. 2632)		....	25,000.00	8,477.98
Division of Medical Education				
Administration (R. F. 2516, 2604)		4,007.46	25,608.00	23,226.05
Totals		$491,477.13	$5,295,790.37	$4,896,216.70
Unexpended balances of appropriations allowed to lapse—				
Travel—University of Brussels (R.F. 2577)	$923.74			
Oswaldo Cruz Institute (R.F. 2641)	1,000.00			
Brazil—Study of Medical Education (R.F. 2630)	1,951.85			
University of Manitoba (R.F. 2602)	16,215.76			
University College (R.F. 2637, 2659)	19,156.25			
University College (R.F. 2653)	6,440.62			
University College Hospital (R.F. 2600)	20,187.12			
University College Hospital (R.F. 2662)	45,596.87			
University of Hongkong (R.F. 2647)	26,250.00			
Salvador—Visiting Pathologist (R.F. 2658)	563.97			
University of Chicago (R.F. 2515, 2603)	12,380.12			
Travel—Belgrade Medical School (R.F. 2576)	3.98			
Fellowships (R.F. 2605, 2606, 2607)	34,311.46			
Division of Medical Education (R.F. 2516, 2604)	6,389.41			
		9,024.67	182,346.48	....
Net Totals		$482,452.46	$5,113,443.89	$4,896,216.70

EXHIBIT D

SCHOOLS OF HYGIENE AND PUBLIC HEALTH

		PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
Harvard University—School of Public Health				
For buildings and equipment (R.F. 2578)		$500,000.00	$........	$........
Toward cost of operation 1922 (R.F. 2639)		....	25,000.00	25,000.00
Interest on pledge of $1,160,000 for endowment (R.F. 2638)		....	58,000.00	24,034.25
General endowment (R.F. 2648)		....	1,160,000.00	1,160,000.00
Johns Hopkins University—School of Hygiene and Public Health				
For the establishment of a school of hygiene and public health (R.F. 2170)		162,354.82	....	2,660.52
Operating expenses (R.F. 2506, 2590)		79,661.18	250,000.00	162,457.08
Land, building, equipment, and endowment (R.F. 2635)		....	6,000,000.00*	6,000,000.00
TOTALS		$742,016.00	$7,493,000.00	$7,374,151.85
Unexpended balances of appropriations allowed to lapse—				
Harvard University (R.F. 2638)	$33,965.75			
Johns Hopkins University (R.F. 2170)	159,694.30			
Johns Hopkins University (R. F. 2506, 2590)	167,204.10			
		177,944.07	182,920.08	....
NET TOTALS		$564,071.93	$7,310,079.92	$7,374,151.85

* Payment of this appropriation was made from the principal fund of the Foundation.

EXHIBIT E

BIOLOGY, PHYSICS, AND CHEMISTRY

		Prior Appropriations	1922 Appropriations	1922 Payments
National Research Council				
Research fellowships in physics and chemistry (R.F. 2517, 2608)		$7,293.47	$100,000.00	$80,770.23
Expenses of Division of Physical Sciences (R.F. 2518)		4,232.65	....	1,490.00
Concilium Bibliographicum				
Current expenses (R.F. 2463, 2519)		11,856.23	....	7,914.04
Current expenses 1922 paid through the National Research Council (R.F. 2610)		....	20,000.00	20,000.00
Totals		$23,382.35	$120,000.00	$110,174.27
Unexpended balances of appropriations allowed to lapse—				
R.F. 2517	$1,025.50			
R.F. 2518	2,742.65			
R.F. 2519	3,942.19			
		7,710.34	....	....
Net Totals		$15,672.01	$120,000.00	$110,174.27

EXHIBIT F

HOSPITAL, DISPENSARY, AND NURSING STUDIES AND DEMONSTRATIONS

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
American Conference on Hospital Service—Equipment and maintenance of library service bureau (R.F. 2595)	$7,000.00	$........	$7,000.00
Committee for the Study of Public Health Nursing			
Study in the proper training of public health nurses (R.F. 2475)	2,150.93	....	2,150.93
Publication of report (R.F. 2667)	....	5,000.00	1,903.00
Committee on Dispensary Development			
Maintenance of service bureau (R.F. 2514)	4,146.89	....	2,807.44
Study and experiment in the district dispensary field (R.F. 2575)	5,442.05	....	1,427.62
Development of a demonstration dispensary in connection with the Presbyterian Hospital 1921 (R.F. 2558)	9,169.28	....	1,392.12
Development of a demonstration dispensary in connection with Cornell Medical College Dispensary 1921 (R.F. 2573)	6,111.25	....	6,111.25
For the work of the Committee during 1922 (R.F. 2573, 2597)	....	140,000.00	103,640.05
Committee on Training of Hospital Administrators—Study of hospital service (R.F. 2574)	13,073.17	....	9,662.54
Hospital and Dispensary Studies—Expenses of studies (R.F. 2513, 2596)	2,091.61	4,000.00	173.64
Study of Nurse Training in Europe—Expenses of study (R.F. 2555, 2627)	10,000.00	10,000.00	4,243.57
L'Ecole de la Salpêtrière—Equipping of demonstration room (R.F. 2663)	....	1,000.00	....
Advanced Training of French Nurses—Training in English or American hospitals of French nurses who may return to France to carry on the supervision of training centers (R.F. 2628)	....	7,000.00	1,144.89
TOTALS	$59,185.18	$167,000.00	$141,657.05

EXHIBIT F—*Continued*

		PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
Unexpended balances of appropriations allowed to lapse—				
Committee on Dispensary Development (R.F. 2575)	$4,014.43			
Committee on Dispensary Development (R.F. 2558)	7,777.16			
Committee on Dispensary Development (R.F. 2514)	1,339.45			
Committee on Training of Hospital Administrators (R.F. 2574)	3,410.63			
Hospital and Dispensary Studies (R.F. 2513)	2,091.61			
Hospital and Dispensary Studies (R.F. 2596)	3,826.36			
Study of Nurse Training in Europe (R.F. 2555)	10,000.00	$28,633.28	$3,826.36	$........
NET TOTALS		$30,551.90	$163,173.64	$141,657.05

EXHIBIT G

PUBLIC HEALTH EDUCATION AND DEMONSTRATIONS—MISCELLANEOUS

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
Common Service Committee—Demonstration in centralized offices for health agencies (R.F. 2583)	$5,695.62	$........	$5,695.62
National Health Council—Toward budget for 1922 (R.F. 2611)	....	10,000.00	10,000.00
New York University—To provide facilities for teaching preventive medicine, hygiene, and sanitation (R.F. 2572)	25,000.00	....	25,000.00
TOTALS	$30,695.62	$10,000.00	$40,695.62

EXHIBIT H

MENTAL HYGIENE

		PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
National Committee for Mental Hygiene				
For the work of the Committee in aiding state commissions on provision for the mentally defective (R.F. 2508)		$4,621.53	$........	$3,367.86
Surveys of the care and treatment of mental deficiency (R.F. 2591)		....	35,000.00	29,321.36
Surveys of the care and treatment of mental diseases (R.F. 2507, 2592)		13,814.85	15,000.00	17,195.97
Establishing uniform statistics on mental diseases (R.F. 2510, 2593)		839.59	4,500.00	4,198.36
Administration expenses (R.F. 2594)		....	10,000.00	10,000.00
Studies in the psychopathology of crime (R.F. 2509)		1,228.61	....	....
TOTALS		$20,504.58	$64,500.00	$64,083.55
Unexpended balances of appropriations allowed to lapse—				
R.F. 2507	$11,052.56			
R.F. 2508	1,253.67			
R.F. 2509	1,228.61			
R.F. 2510	25.27			
		13,560.11	....	....
NET TOTALS		$6,944.47	$64,500.00	$64,083.55

EXHIBIT I
MISCELLANEOUS

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
American Academy in Rome—General purposes, $10,000 a year for ten years beginning 1914 (R.F. 215). Instalment due 1922	$........	$10,000.00	$10,000.00
Committee of Reference and Counsel of the Annual Foreign Missions Conference of North America			
For carrying out its program of co-operation and co-ordination in foreign missionary work of the principal American Mission Boards. Total pledge of $425,000 extending over a period of ten years beginning 1914 (R.F. 228). Instalment due 1922	....	30,000.00	30,000.00
Johns Hopkins University—Study of fluke disease (R.F. 2568)	750.00	....	750.00
National Information Bureau—Sustaining membership 1922 (R.F. 2629)	....	1,000.00	1,000.00
New York Association for Improving the Condition of the Poor—Providing pensions for dependent widows with families, $20,000 a year for ten years beginning 1914 (R.F. 239)			
Balance of instalment due 1921	10,000.00	....	10,000.00
Instalment due 1922	....	20,000.00	10,000.00
Grand Chenier Wild Life Refuge—Taxes and expenses (R.F. 2548)	3,232.12	....	....
War Relief Commission—Administration—1917 (R.F. 2216)	644.75	....	....
	$14,626.87	$61,000.00	$61,750.00
Asset Accounts			
Furniture and fixtures (R.F. 2616)	....	4,000.00	3,692.22
Books for the library (R.F. 2617, 2666)	....	900.00	654.09
TOTALS	$14,626.87	$65,900.00	$66,096.31

EXHIBIT I—*Continued*

Unexpended balances of appropriations allowed to lapse—				
Furniture and fixtures (R.F. 2616)	$307.78			
Books for the library (R.F. 2666)	245.91	....	$553.69	....
NET TOTALS		$14,626.87	$65,346.31	$66,096.31
Administration				
Executive Offices (R.F. 2560, 2612, 2615, 2643)		$1,528.13	$159,144.75	$154,084.01
Treasurer's Office (R.F. 2522, 2547, 2613, 2614)		4,209.37	16,543.65	14,958.16
TOTALS		$5,737.50	$175,688.40	$169,042.17
Unexpended balances of appropriations allowed to lapse—				
R.F. 2560	$1,223.36			
R.F. 2522	1,120.47			
R.F. 2612	3,221.70			
R.F. 2613	154.68			
R.F. 2615	2,143.81	2,343.83	5,520.19	....
NET TOTALS		$3,393.67	$170,168.21	$169,042.17
Refunds of amounts disbursed in prior years—Rockefeller Institute for Medical Research				
War Research and Relief 1918 (R.F. 2327)		$534.84		
Preparation of Serum (R.F. 2394)		176.28		
War Demonstration Hospital (R.F. 2386)		4,832.98		
		$5,544.10		

EXHIBIT J

1922 INTERNATIONAL HEALTH BOARD APPROPRIATIONS *
BALANCES OF APPROPRIATIONS MADE IN PRIOR YEARS AND PAYMENTS THEREON MADE IN 1922

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
COUNTY HEALTH WORK			
United States			
Alabama			
1921 (I.H. 21059, 21062–63, 21065–67, 21162–63, 21228–30, 21421–22)	$8,868.91	$625.00	$4,301.80
1922 (I.H. 21276–85, 21636–37)	....	20,725.00	9,077.52
California			
1922 (I.H. 21650)	....	208.33	......
Florida			
1921 (I.H. 21387)	262.50	....	237.75
1922 (I.H. 21427)	....	3,100.00	772.08
Georgia			
1921 (I.H. 21028)	5,000.00	....	4,338.17
1922 (I.H. 21286)	....	5,000.00	2,444.64
Illinois			
1922 (I.H. 21495)	....	1,562.50	666.66
Indiana			
1922 (I.H. 21416–18, 21482–84)	....	9,000.00	891.66
Kansas			
1921 (I.H. 21183–89)	5,126.90	....	1,941.40
1922 (I.H. 21287–93)	....	11,900.00	6,018.95

* The Foundation provides for the cost of work carried on by the International Health Board by making to the Board one or more appropriations to cover its work during the year. From these large grants the Board then makes its own appropriations for specific objects.

EXHIBIT I—*Continued*

Unexpended balances of appropriations allowed to lapse—				
Furniture and fixtures (R.F. 2616)	$307.78			
Books for the library (R.F. 2666)	245.91			
		....	$553.69	....
NET TOTALS		$14,626.87	$65,346.31	$66,096.31
Administration				
Executive Offices (R.F. 2560, 2612, 2615, 2643)		$1,528.13	$159,144.75	$154,084.01
Treasurer's Office (R.F. 2522, 2547, 2613, 2614)		4,209.37	16,543.65	14,958.16
TOTALS		$5,737.50	$175,688.40	$169,042.17
Unexpended balances of appropriations allowed to lapse—				
R.F. 2560	$1,223.36			
R.F. 2522	1,120.47			
R.F. 2612	3,221.70			
R.F. 2613	154.68			
R.F. 2615	2,143.81			
		2,343.83	5,520.19	....
NET TOTALS		$3,393.67	$170,168.21	$169,042.17
Refunds of amounts disbursed in prior years—Rockefeller Institute for Medical Research				
War Research and Relief 1918 (R.F. 2327)		$534.84		
Preparation of Serum (R.F. 2394)		176.28		
War Demonstration Hospital (R.F. 2386)		4,832.98		
		$5,544.10		

EXHIBIT J

1922 INTERNATIONAL HEALTH BOARD APPROPRIATIONS *
BALANCES OF APPROPRIATIONS MADE IN PRIOR YEARS AND PAYMENTS THEREON MADE IN 1922

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
COUNTY HEALTH WORK			
United States			
Alabama			
1921 (I.H. 21059, 21062–63, 21065–67, 21162–63, 21228–30, 21421–22)	$8,868.91	$625.00	$4,301.80
1922 (I.H. 21276–85, 21636–37)	....	20,725.00	9,077.52
California			
1922 (I.H. 21650)	....	208.33	......
Florida			
1921 (I.H. 21387)	262.50	....	237.75
1922 (I.H. 21427)	....	3,100.00	772.08
Georgia			
1921 (I.H. 21028)	5,000.00	....	4,338.17
1922 (I.H. 21286)	....	5,000.00	2,444.64
Illinois			
1922 (I.H. 21495)	....	1,562.50	666.66
Indiana			
1922 (I.H. 21416–18, 21482–84)	....	9,000.00	891.66
Kansas			
1921 (I.H. 21183–89)	5,126.90	....	1,941.40
1922 (I.H. 21287–93)	....	11,900.00	6,018.95

* The Foundation provides for the cost of work carried on by the International Health Board by making to the Board one or more appropriations to cover its work during the year. From these large grants the Board then makes its own appropriations for specific objects.

EXHIBIT J—*Continued*

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
COUNTY HEALTH WORK—*Continued*			
United States—*Continued*			
Kentucky			
1921 (I.H. 21084–90)	$6,314.01	$........	$4,545.61
1922 (I.H. 21377–83)	....	17,900.00	8,073.07
Louisiana			
1921 (I.H. 21179–81, 21223–25)	5,467.31	....	3,352.70
1922 (I.H. 21294–99)	....	15,500.00	10,292.97
Maryland			
1921 (I.H. 21164)	4,351.67	....	1,815.36
1922 (I.H. 21481, 21516)	....	7,540.00	3,532.62
Mississippi			
1921 (I.H. 21019–24, 21026, 21108)	12,631.23	....	8,250.62
1922 (I.H. 21300–306, 21522)	....	17,250.00	4,686.62
Missouri			
1921 (I.H. 21194)	600.00	....	600.00
1922 (I.H. 21307, 21394–96, 21419, 21428–29)	....	9,500.00	3,635.57
New Mexico			
1921 (I.H. 21068–70)	3,286.59	....	3,286.59
1922 (I.H. 21308–15, 21384–86, 21485, 21665)	....	13,165.00	3,814.47
North Carolina			
1921 (I.H. 21113–27, 21467–68)	8,091.82	1,000.00	7,588.53
1922 (I.H. 21420)	....	10,000.00	....
Oregon			
1922 (I.H. 21535)	....	620.00	....
South Carolina			
1921 (I.H. 21136–43)	4,779.08	....	4,431.05
1922 (I.H. 21316–22)	....	13,500.00	6,755.72

Tennessee			
1921 (I.H. 21041–45, 21205)	4,464.89	....	3,538.81
1922 (I.H. 21323–28, 21536–40)	....	22,250.00	7,081.89
Texas			
1921 (I.H. 21093–98, 21219–22)	4,619.20	....	2,375.00
1922 (I.H. 21397–400)	....	10,000.00	1,578.59
Virginia			
1921 (I.H. 21079–83, 21128)	8,134.78	....	7,624.19
1922 (I.H. 21368–72, 21496–500, 21543)	....	18,687.51	8,210.01
West Virginia			
1921 (I.H. 21107, 21176–78, 21226)	5,617.06	....	1,875.64
1922 (I.H. 21443–47)	....	9,658.33	2,806.54
Foreign Countries			
Brazil			
1922 (I.H. 21257, 21263, 21518–20, 21542)	....	20,764.59	3,892.79
HOOKWORM WORK			
Central America			
Costa Rica			
1921 (I.H. 2969)	3,223.59	....	699.73
1922 (I.H. 21247)	....	5,500.00	20.57
Guatemala			
1921 (I.H. 2970)	9,266.44	....	1,747.53
1922 (I.H. 21248)	....	19,740.00	7,450.05
Honduras			
1922 (I.H. 21423, 21487)	....	11,816.67	1,683.40
Nicaragua			
1921 (I.H. 2971, 21462)	3,717.03	230.00	3,946.23
1922 (I.H. 21249)	....	7,280.00	5,060.57
Panama			
1921 (I.H. 2972)	4,107.59	....	142.18
1922 (I.H. 21250)	....	21,600.00	14,744.48
Salvador			
1921 (I.H. 2973)	1,342.36	....	7.53

EXHIBIT J—*Continued*

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
HOOKWORM WORK—*Continued*			
South America			
Brazil			
1921 (I.H. 2975–76, 2979–84, 21014, 21071, 21077–78, 21148–50, 21246)	$120,902.84	$........	$78,256.62
1922 (I.H. 21251–56, 21258–62, 21264–65, 21479–80, 21486, 21521, 21634)	....	192,920.83	89,304.72
British Guiana			
1921 (I.H. 2989)	5,250.00	....	487.21
1922 (I.H. 21267–68)	....	10,587.50	210.28
Colombia			
1921 (I.H. 2985–87)	24,402.56	....	7,265.95
1922 (I.H. 21366)	....	19,100.00	9,269.73
Dutch Guiana			
1921 (I.H. 2990, 21217)	8,269.33	....	5,949.71
1922 (I.H. 21269)	....	12,955.00	6,065.04
West Indies			
Antigua			
1922 (I.H. 21266)	....	1,085.00	872.27
Jamaica			
1921 (I.H. 2992)	8,607.94	....	2,618.66
1922 (I.H. 21270)	....	15,300.00	8,524.94
Porto Rico			
1921 (I.H. 2993)	12,876.46	....	1,071.21
1922 (I.H. 21271)	....	24,580.00	10,012.19
St. Lucia			
1921 (I.H. 2995)	2,710.22	....	2,096.84
1922 (I.H. 21272)	....	9,282.80	4,142.56

Trinidad			
1921 (I.H. 2996)	6,672.38	....	3,961.69
1922 (I.H. 21273)	....	11,640.00	4,110.74
Europe			
Spain—Survey (I.H. 21474)	....	5,000.00	....
The East			
Australia			
1921 (I.H. 21012, 21523)	13,195.69	1,372.09	14,567.78
1922 (I.H. 21274)	....	28,750.00	5,594.36
British North Borneo			
1921 (I.H. 21156)	5,084.82	....	802.91
1922 (I.H. 21367)	....	2,560.00	472.75
British Solomon Islands			
1921 (I.H. 21133)	795.50	....	616.05
1922 (I. H. 21473)	....	234.22	225.60
Ceylon			
1921 (I.H. 2775, 2910, 2997–21000)	19,625.00	....	....
Egypt			
1915 (I.H. 237)	4,641.88	....	....
Fiji			
1921 (I.H. 21355)	1,508.79	....	7.43
1922 (I.H. 21405, 21452)	....	6,400.00	3,445.54
Java			
1922 (I.H. 21477)	....	5,000.00	....
Mauritius			
1922 (I.H. 21442, 21531)	....	8,000.00	651.96
Siam			
1921 (I.H. 21001)	1,273.96	....	302.14
1922 (I.H. 21275, 21504)	....	16,300.00	6,756.87

EXHIBIT J—*Continued*

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
HOOKWORM WORK—*Continued*			
South America			
Brazil			
1921 (I.H. 2975–76, 2979–84, 21014, 21071, 21077–78, 21148–50, 21246)	$120,902.84	$........	$78,256.62
1922 (I.H. 21251–56, 21258–62, 21264–65, 21479–80, 21486, 21521, 21634)	....	192,920.83	89,304.72
British Guiana			
1921 (I.H. 2989)	5,250.00	....	487.21
1922 (I.H. 21267–68)	....	10,587.50	210.28
Colombia			
1921 (I.H. 2985–87)	24,402.56	....	7,265.95
1922 (I.H. 21366)	....	19,100.00	9,269.73
Dutch Guiana			
1921 (I.H. 2990, 21217)	8,269.33	....	5,949.71
1922 (I.H. 21269)	....	12,955.00	6,065.04
West Indies			
Antigua			
1922 (I.H. 21266)	....	1,085.00	872.27
Jamaica			
1921 (I.H. 2992)	8,607.94	....	2,618.66
1922 (I.H. 21270)	....	15,300.00	8,524.94
Porto Rico			
1921 (I.H. 2993)	12,876.46	....	1,071.21
1922 (I.H. 21271)	....	24,580.00	10,012.19
St. Lucia			
1921 (I.H. 2995)	2,710.22	....	2,096.84
1922 (I.H. 21272)	....	9,282.80	4,142.56

Trinidad			
1921 (I.H. 2996)	6,672.38	....	3,961.69
1922 (I.H. 21273)	....	11,640.00	4,110.74
Europe			
Spain—Survey (I.H. 21474)	....	5,000.00	....
The East			
Australia			
1921 (I.H. 21012, 21523)	13,195.69	1,372.09	14,567.78
1922 (I.H. 21274)	....	28,750.00	5,594.36
British North Borneo			
1921 (I.H. 21156)	5,084.82	....	802.91
1922 (I.H. 21367)	....	2,560.00	472.75
British Solomon Islands			
1921 (I.H. 21133)	795.50	....	616.05
1922 (I. H. 21473)	....	234.22	225.60
Ceylon			
1921 (I.H. 2775, 2910, 2997–21000)	19,625.00	....	....
Egypt			
1915 (I.H. 237)	4,641.88	....	....
Fiji			
1921 (I.H. 21355)	1,508.79	....	7.43
1922 (I.H. 21405, 21452)	....	6,400.00	3,445.54
Java			
1922 (I.H. 21477)	....	5,000.00	....
Mauritius			
1922 (I.H. 21442, 21531)	....	8,000.00	651.96
Siam			
1921 (I.H. 21001)	1,273.96	....	302.14
1922 (I.H. 21275, 21504)	....	16,300.00	6,756.87

EXHIBIT J—*Continued*

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
HOOKWORM WORK—*Continued*			
The East—*Continued*			
Miscellaneous			
Study of various methods of diagnosis used in connection with hookworm disease (I.H. 21165)	$1,000.00	$........	$758.57
Portable house and office at Salvador (I.H. 2839)	75.00	....	....
Research in life history of hookworm eggs and larvae (I.H. 2964, 21464)	74.50	6,000.00	5,419.44
Study of ankylostome larvae in Ceylon (I.H. 21508)	....	450.00	....
Resurveys in selected counties in the Southern States (I.H. 21154, 21216, 21409)	3,638.69	10,000.00	7,672.05
Motion picture film on hookworm disease (I.H. 2947)	397.53	....	....
MALARIA WORK			
Southern States			
Alabama			
1921 (I.H. 21145, 21158–59, 21196–97)	1,000.99	....	608.05
1922 (I.H. 21430, 21433–34, 21465, 21744)	....	8,458.63	3,003.00
Arkansas			
1921 (I.H. 21241)	1,477.85	....	1,245.93
1922 (I.H. 21411)	....	5,000.00	2,294.43
Georgia			
1922 (I.H. 21432)	....	2,017.08	1,492.00
Illinois			
1922 (I.H. 21494)	....	1,000.00	422.80
Louisiana			
1921 (I.H. 21051, 21106, 21135, 21160)	7,483.44	....	3,535.08
1922 (I.H. 21412, 21461, 21466, 21510)	....	14,978.33	6,309.94

Mississippi			
1921 (I.H. 2546, 21027, 21111–12, 21134, 21192–93, 21198, 21209, 21240)	19,399.89	....	6,476.38
1922 (I.H. 21413, 21453–56, 21470, 21517, 21532, 21674)	....	9,320.83	4,095.64
Missouri			
1921 (I.H. 21211)	833.33	....	813.58
1922 (I.H. 21435–38, 21509, 21675)	....	6,450.00	200.00
North Carolina			
1921 (I.H. 21110, 21152, 21239)	7,197.39	....	1,881.17
1922 (I.H. 21393)	....	10,000.00	1,028.43
South Carolina			
1921 (I.H. 21072–76, 21200–03, 21242–45)	18,022.50	....	12,208.72
1922 (I.H. 21414, 21431, 21490–93, 21641, 21677)	....	14,690.00	309.76
Tennessee			
1921 (I.H. 2892–93, 21161, 21175, 21410)	4,167.00	275.00	2,469.97
1922 (I.H. 21533–34)	....	314.00	....
Texas			
1922 (I.H. 21460, 21472)	....	2,415.00	....
Virginia			
1921 (I.H. 21199)	1,218.75	....	831.65
1922 (I.H. 21415, 21441, 21457–59, 21471, 21489)	....	6,062.50	3,116.14
Conference of malaria workers (I.H. 21238, 21639)	219.05	250.00	385.08
Study to determine source of blood meals of Anopheles mosquitoes (I.H. 21213)	134.37	....	....
Central America			
Nicaragua			
1921 (I.H. 21174)	744.36	....	637.41
1922 (I.H. 21358)	....	1,589.00	1,079.58
South America			
Brazil—Field Studies (I.H. 21488)	....	23,681.25	7,537.65

EXHIBIT J—(*Continued*)

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
MALARIA WORK—*Continued*			
Southern States—*Continued*			
West Indies			
Porto Rico			
1921 (I.H. 21018, 21109, 21191)	$7,737.78	$........	$5,464.39
1922 (I.H. 21364–65, 21440)	....	27,075.00	8,366.37
Europe			
Italy (I.H. 21476)	....	5,000.00	....
The East			
Palestine—Field Studies (I.H. 21640)	....	559.50	....
Philippine Islands (I.H. 21389)	....	10,000.00	584.86
YELLOW FEVER			
Brazil			
1921 (I.H. 21214)	1,000.00	....	461.30
1922 (I.H. 21406)	....	1,000.00	....
Ecuador			
1921 (I.H. 21204)	938.35	....	938.35
1922 (I.H. 21407)	....	4,000.00	2,641.34
Mexico and Central America			
1921 (I.H. 21058)	61,650.04	....	38,743.62
1922 (I.H. 21402, 21450, 21530)	....	120,000.00	65,694.48
Peru			
1921 (I.H. 21354)	72,318.88	....	62,631.71
1922 (I.H. 21401, 21449)	....	50,000.00	36,034.58
West Africa (I.H. 21392)	....	5,000.00	2,923.73
Vaccine and Serum (I.H. 21408, 21541)	....	6,000.00	5,037.99
History of Yellow Fever (I.H. 21478)	....	600.00	232.19
Epidemic Work (I.H. 21048)	394.95	....	394.95

TUBERCULOSIS IN FRANCE			
Central Administration			
1921 (I.H. 21004)	22,882.97	....	16,301.01
1922 (I.H. 21329)	....	100,030.00	53,100.70
Departmental Organization			
1921 (I.H. 21008)	41,012.15	....	20,553.43
1922 (I.H. 21332)	....	32,000.00	11,431.43
Educational Division			
1921 (I.H. 21007)	29,659.64	....	13,015.34
1922 (I.H. 21331)	....	108,765.00	30,874.56
Medical Division			
1921 (I.H. 21005)	27,759.82	....	7,168.83
Public Health Visiting			
1921 (I.H. 21006)	48,445.83	....	20,946.51
1922 (I.H. 21330)	....	152,280.00	51,199.20
Contingent Fund			
1921 (I.H. 2963)	9,250.00	....	....
1922 (I.H. 21334)	....	10,000.00	2,490.94
Postgraduate Tuberculosis Courses			
1922 (I.H. 21333)	....	10,000.00	3,115.77
PUBLIC HEALTH EDUCATION			
Schools of Hygiene and Public Health			
Brazil, São Paulo—Department of Hygiene			
Operation (I.H. 21132, 21336)	4,293.49	20,000.00	13,122.61
Equipment and Supplies (I.H. 21647)	....	2,500.00	751.05
Czechoslovakia—Institute of Public Health, Prague (I.H. 21207, 21391, 21680)	250,000.00	150,000.00	2,212.95
England—School of Hygiene, London (I.H. 21448, 21469)	....	234,000.00	22,774.78
Poland—Institute of Hygiene, Warsaw (I.H. 21524)	....	100,000.00	....

EXHIBIT J—*Continued*

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
PUBLIC HEALTH EDUCATION—*Continued*			
Study and Training Courses for Health Officers			
Alabama—Birmingham (I.H. 21374, 21527)	$175.00	$200.00	$332.07
New York—Albany (I.H. 21363)	368.00	....	311.92
Michigan—Lansing (I.H. 21638)	....	600.00	....
Mississippi—Jackson (I.H. 21544)	....	500.00	467.73
Ohio—Columbus (I.H. 21512)	....	300.00	266.49
Correspondence Course for Health Officers (I.H. 21375, 21376)	125.00	1,800.00	1,383.54
Correspondence Course for Health Nurses (I.H. 21645)	....	337.50	....
Fellowships			
Grants to doctors for study of public health (I.H. 21348–50, 21505–06, 21679)	....	167,500.00	112,626.47
PUBLIC HEALTH ADMINISTRATION			
United States			
Aid in developing State Health Services			
Missouri—Division of Sanitary Engineering (I.H. 21501)	....	1,050.00	....
Utah—Division of Sanitary Engineering (I.H. 21502)	....	805.00	....
Czechoslovakia (I.H. 2961, 21335, 21503)	9,138.71	8,880.00	7,306.97
Philippine Islands—Secretary for Consultant to Governor-General (I.H. 21390)	....	3,000.00	1,345.81
Canada—New Brunswick—Rural health program (I.H. 21526)	....	9,000.00	9,000.00
League of Nations—Maintenance of an International Interchange of Public Health Personnel (I.H. 21525, 21633)	....	15,020.00	....
Brazil—Toward development of a Public Health Nursing Service (I.H. 21425, 21463)	....	10,900.00	4,750.91

PUBLIC HEALTH LABORATORY SERVICE			
United States			
Alabama (I.H. 21515)	....	3,600.00	....
Kansas (I.H. 21099, 21182, 21337)	3,157.78	5,500.00	5,350.64
Missouri (I.H. 21426)	....	1,041.67	333.34
Tennessee (I.H. 21678)	....	250.00	....
Central America			
Guatemala (I.H. 21235, 21507)	1,489.92	600.00	420.18
Honduras (I.H. 21513)	....	3,000.00	....
Nicaragua (I.H. 21236, 21338, 21529)	1,050.00	5,600.00	2,226.64
Salvador (I.H. 21234, 21514)	1,500.00	600.00	1,513.06
Demonstrations (I.H. 21144)	291.00	....	....
ADMINISTRATIVE FIELD STAFF			
Salaries (I.H. 2949, 21340)	26,858 39	412,000.00	353,985.71
Traveling Expenses (I.H. 2951, 21342)	15,655.15	112,000.00	106,072.06
Commutation (I.H. 2950, 21341)	29,801.10	60,000.00	42,954.26
Medical Examinations (I.H. 21346)	....	700.00	632.00
Drugs for Conserving Health (I.H. 21345)	....	1,000.00	7.98
Bonding (I.H. 21344)	....	5,000.00	2,662.52
Traveling Expenses of Families (I.H. 2952, 21343)	6,011.55	15,000.00	13,709.06
Automobiles for Directors in Training (I.H. 21347)	....	3,000.00	772.77
MISCELLANEOUS			
Express, Freight, and Exchange (I.H. 21353)	....	5,000.00	....
Field Equipment and Supplies (I.H. 21351, 21528)	....	6,000.00	5,189.62
Expenses in connection with the compilation of a mining sanitary code (I.H. 21373, 21451)	14.02	85.00	77.20
Pamphlets and Charts (I.H. 21352, 21359)	7,846.56	10,000.00	8,869.43
Expenses in connection with the visit to the United States of Brazilian Scientists (I.H. 21104, 21206)	301.61	....	161.73
Expenses in connection with the visit to England and the United States of French Scientist (I.H. 21475)	....	3,000.00	2,068.37

EXHIBIT J—*Continued*

		PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
MISCELLANEOUS—*Continued*				
Expenses in connection with the visit to England, Germany, and the United States of Polish Scientist (I.H. 21642)		$........	$3,000.00	$........
ADMINISTRATION (I.H. 21339, 21388)		....	178,845.50	170,911.80
			$3,003,166.16	
Unappropriated balance of Rockefeller Foundation appropriation to the International Health Board for London School of Hygiene and Warsaw Institute of Hygiene (R.F. 2646, 2664)		....	138,500.00	....
TOTALS		$1,093,302.66	$3,141,666.16	$1,878,253.31
Appropriations for expenditures made in certain foreign countries are based on fixed rates of exchange. This amount represents the difference between the cost at the fixed rate and the actual cost of such exchange items		....	....	35,876.51
Unexpended balances of appropriations allowed to lapse—				
Prior Year		397,349.74	....	....
1922	$255,668.35	....	....	....
Difference in exchange as above	35,876.51			
		....	291,544.86	....
NET TOTALS *		$695,952.92	$2,850,121.30	$1,842,376.80
Refund on prior year appropriation Argentina Malaria Survey (I.H. 21046)	$127.49			

* The Foundation appropriated to the International Health Board for its work during the year 1922 the sum of $2,972,500.00.

EXHIBIT K

1922 CHINA MEDICAL BOARD APPROPRIATIONS * AND BALANCES OF APPROPRIATIONS MADE IN PRIOR YEARS, AND PAYMENTS THEREON MADE IN 1922

	Prior Appropriations	1922 Appropriations	1922 Payments
Hospitals of Missionary Societies			
American Baptist Foreign Mission Society			
Ningpo—Salaries of doctor and nurse, $2,250 a year for five years beginning 1920 (C.M. 276)			
Balance due on previous instalments	$4,500.00	$........	$........
Instalment for 1922	....	2,250.00	....
Shaohsing			
Support of foreign nurse, Chinese manager, and foreign doctor, $2,475 a year for five years beginning 1920 (C.M. 277)			
Balance due on previous instalments	4,200.00	....	....
Instalment due 1922	....	2,475.00	....
Equipment and residences for physician, nurse, and Chinese staff (C.M. 278, 2319)	5,625.00	....	....
American Board of Commissioners for Foreign Missions			
Fenchow			
Buildings, and equipment, Mex. 6,250.00 (C.M. 2518)	4,000.00	....	3,578.13
Salaries of additional staff, $3,700 a year for five years beginning 1921 (C.M. 2519)			
Instalment due 1921	3,700.00	....	....
Instalment due 1922	....	3,700.00	....

* The Foundation provides for the cost of work carried on by the China Medical Board by making to the Board one or more appropriations to cover its work for the year. From these large grants the Board then makes its own appropriations for specific objects.

EXHIBIT K—*Continued*

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
HOSPITALS OF MISSIONARY SOCIETIES—*Continued*			
American Board of Commissioners for Foreign Missions—*Continued*			
Fenchow—*Continued*			
Current expenses, Mex. 2,500 a year for five years beginning 1921 (C.M. 2520)			
Instalment due 1921	$1,500.00	$........	$1,421.88
Instalment due 1922	....	1,500.00	....
Tehchow			
Salary of two doctors, $3,236 a year for five years beginning 1915 (C.M. 211, 294) Balance due on instalments	11,796.60	....	....
Employees' salaries, $4,152 a year for five years beginning 1916 (C.M. 297, 2229) Balance due on instalments	4,040.75	....	277.11
Salary of business manager, $3,525.88 extending over a period of four years beginning 1918 (C.M. 2360)			
Balance due on previous instalments	712.70	....	712.70
Instalment due 1922	....	475.13	237.58
Support of successor to Dr. Lee M. Miles, $1,091 a year for five years beginning 1921. To cover one half of loss on exchange $2,545 (C.M. 2498)			
Instalment due 1921	3,636.00	....	....
Instalment due 1922	....	1,091.00	....
Maintenance $2,310.50 a year for five years beginning 1922 (C.M. 2571) Instalment due 1922	....	2,310.50	....
Buildings and equipment (C.M. 2570)	....	900.00	900.00

Board of Foreign Missions of the Methodist Episcopal Church			
Peking			
Salary of doctor, $2,400 a year for five years beginning 1916 (C.M. 223, 2102) Balance due on instalments	8,800.00	....	....
Support of dentist, medical practitioner, and nurse, $22,500 extending over a period of five years beginning 1920 (C.M. 2266)			
Instalment due 1922	....	4,500.00	....
Support of two dentists, $2,400 a year for five years beginning 1921 (C.M. 2522)			
Instalment due 1921	2,400.00	....	....
Instalment due 1922	....	2,400.00	600.00
Residences for two dentists (C.M. 2523)	8,000.00	....	....
Initial equipment for dental department (C.M. 2540)	10,000.00	....	....
Wuhu			
Building of hospital and residences (C.M. 2384, 2499)	70,000.00	....	....
Salaries of additional staff and maintenance expenses, $7,250 a year for five years beginning 1920 (C.M. 2385)			
Balance due on previous instalments	10,375.00	....	7,325.67
Instalment due 1922	....	7,250.00	....
Board of Missions of the Methodist Episcopal Church, South			
Soochow			
Salary of nurse, $600 a year for five years beginning 1916 (C.M. 236, 2105) Balance due on instalments	1,800.00	....	....
Building and equipment, Mex. 45,000 (C.M. 2577)	....	27,000.00	26,212.50
Maintenance of additional foreign staff, Mex. 8,000 a year for five years beginning 1920 (C.M. 2418)			
Balance due on previous instalments	19,000.00	....	....
Instalment due 1922	....	9,500.00	....
Board of Missions of the Methodist Episcopal Church, South—American Baptist Foreign Mission Society, Jointly			
Huchow			
Building and equipment (C.M. 2151)	10,000.00	....	10,000.00

EXHIBIT K—*Continued*

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
HOSPITALS OF MISSIONARY SOCIETIES—*Continued*			
Board of Missions of the Methodist Episcopal Church, South, American Baptist Foreign Mission Society, Jointly—*Continued*			
Huchow—*Continued*			
Support of foreign physician, $5,025 extending over a period of five years beginning 1920 (C.M. 2152)			
Balance due on previous instalments	$2,475.00	$........	$2,475.00
Instalment due 1922	....	825.00	....
Support of foreign nurse, $3,000 extending over a period of five years beginning 1920 (C.M. 2153)			
Balance due on previous instalments	1,275.00	....	1,275.00
Instalment due 1922	....	450.00	....
Support of Chinese physician, $2,250 extending over a period of five years beginning 1920 (C.M. 2154)			
Balance due on previous instalments	900.00	....	900.00
Instalment due 1922	....	450.00	....
Board of Foreign Missions of the Presbyterian Church in the U. S. A.			
Changteh			
Current expenses, $2,625 a year for five years beginning 1916 (C.M. 2144) Balance due on instalments	3,768.75	....	3,318.75
Current expenses, $2,250 a year for five years beginning 1918 (C.M. 2318) Instalment due 1922	....	2,250.00	2,250.00
Chefoo			
Salary and allowance of doctor and nurse, $2,625 a year for five years beginning 1917 (C.M. 284) Balance due on instalments	9,811.30	....	3,450.00
Operating expenses, $2,250 a year for five years beginning 1918 (C.M. 2243) Instalment due 1922	....	2,250.00	2,250.00

Hwaiyuen			
Salary and allowance of physician and nurse and operating expenses, $3,375 a year for five years beginning 1919 (C.M. 285)			
Balance due on previous instalments	7,725.00	....	7,162.50
Instalment due 1922	....	3,375.00	....
Residence of doctor and equipment (C.M. 286, 2553)	2,250.00	750.00	3,000.00
Paotingfu			
Support of business manager, $900 a year for four years beginning 1918 (C.M. 2306) Instalment due 1921	900.00	....	675.00
Maintenance, $4,500 a year for five years beginning 1922 (C.M. 2572) Instalment due 1922	....	4,500.00	2,250.00
Paotingfu, Shuntehfu			
Support of additional staff, $9,200 a year for five years beginning 1916 (C.M. 214, 295) Balance due on instalments	14,025.00	....	1,650.00
Shuntehfu			
Maintenance, $750 a year for five years beginning 1916 (C.M. 2142) Balance due on instalments	437.50	....	437.50
Maintenance, $6,000 extending over a period of three years beginning 1922 (C.M. 2573) Instalment due 1922	....	2,250.00	1,125.00
Board of Foreign Missions of the Reformed Church in America			
Hope and Wilhelmina Hospital			
Purchase of equipment (C.M. 2282)	2,025.00	....	....
Support of physician, $1,881 a year for five years beginning 1920 (C.M. 2283)			
Balance due on previous instalments	3,762.00	....	....
Instalment due 1922	....	1,881.00	....
Canton Christian College, Canton			
Current expenses 1921–1922, Mex. 9,000 (C.M. 2541)	5,500.00	....	....
Church of Scotland Foreign Mission Committee, Ichang			
Support of third foreign doctor and nurse, $2,250 a year for five years beginning 1920 (C.M. 289)			
Balance due on previous instalments	3,750.00	....	750.00
Instalment due 1922	....	2,250.00	....

EXHIBIT K—*Continued*

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
HOSPITALS OF MISSIONARY SOCIETIES—*Continued*			
Domestic and Foreign Mission Society of the Protestant Episcopal Church in the U. S. A.			
Anking			
Operating expenses, $4,200 a year for five years beginning 1919 (C.M. 2308)			
Balance due on previous instalments	$3,600.00	$........	$2,025.00
Instalment due 1922	....	4,200.00	1,500.00
Executive Committee of Foreign Missions of the Presbyterian Church in the U. S., South			
Soochow, Kashing			
Support of additional staff. Salaries, $3,600 a year for five years beginning 1915 (C.M. 221, 2101) Balance due on instalments	13,625.00	....	....
Foreign Mission Board of the Southern Baptist Convention			
Chengchow			
Salary of doctor, $1,200 a year for five years beginning 1916 (C.M. 228, 2106) Balance due on instalments	3,250.00	....	....
Hwanghien			
Salary of physician, $900 a year for five years beginning 1920 (C.M. 281)			
Balance due on previous instalments	1,800.00	....	....
Instalment due 1922	....	900.00	....
Outfit and travel of physician (C.M. 282)	750.00	....	....
Salary of nurse, $600 a year for five years beginning 1916 (C.M. 225, 2103) Balance due on instalments	1,500.00	....	....

Laichowfu			
Equipment and outgoing expenses of physician and wife (C.M. 280)	750.00	....	....
Salary of physician and wife and nurse, $1,650 a year for five years beginning 1920 (C.M. 279)			
Balance due on previous instalments	3,300.00	....	....
Instalment due 1922	....	1,650.00	....
Yanchow			
Salary of nurse, $600 a year for five years beginning 1916 (C.M. 232, 2104) Balance due on instalments	1,625.00	....	....
Maintenance Mex. 2,000 a year for five years beginning 1921 (C.M. 2525)			
Instalment due 1921	1,000.00	....	1,000.00
Instalment due 1922	....	1,000.00	1,000.00
London Missionary Society			
Siaochang			
Support of nurse, $600 a year for five years beginning 1920 (C.M. 2167)			
Balance due on previous instalments	1,200.00	....	....
Instalment due 1922	....	600.00	....
Tsangchow			
Support of nurse, $750 a year for five years beginning 1918 (C.M. 2326)			
Balance due on previous instalments	2,250.00	....	....
Instalment due 1922	....	750.00	....
Medical Mission Auxiliary of London			
Tai Yuan Fu			
Improvements and supplies (C.M. 2201)	1,702.22	....	1,702.22
Nanking Union Hospital			
Buildings and equipment—Mex. 45,000 (C.M. 2574)	....	27,000.00	....
Maintenance, $9,250 a year for five years beginning 1917 (C.M. 2137)			
Balance due on previous instalments	18,500.00	....	18,500.00

EXHIBIT K—*Continued*

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
HOSPITALS OF MISSIONARY SOCIETIES—*Continued*			
Nanking Union Hospital—*Continued*			
Maintenance, $9,250 a year for five years beginning 1922 (C.M. 2575)			
Instalment due 1922	$........	$9,250.00	$........
United Christian Missionary Society			
(formerly the Foreign Christian Missionary Society)			
Luchowfu			
Buildings and fixed equipment (C.M. 2327)	500.00	....	....
Movable equipment (C.M. 2328)	4,800.00	....	....
Maintenance $4,100 a year for five years beginning 1920 (C.M. 2329)			
Balance due on previous instalments	8,200.00	....	....
Instalment due 1922	....	4,100.00	....
Salary of second foreign nurse, $1,400 a year for five years beginning 1920 (C.M. 2330)			
Balance due on previous instalments	2,800.00	....	....
Instalment due 1922	....	1,400.00	....
Salary of business manager, $1,400 a year for five years beginning 1920 (C.M. 2331)			
Balance due on previous instalments	2,800.00	....	870.00
Instalment due 1922	....	1,400.00	....
Luchowfu, Nantungchow			
Support of additional staff, $4,200 a year for five years beginning 1918 (C.M. 215, 2100)			
Balance due on previous instalments	13,605.00	....	2,512.50
Instalment due 1922	....	4,200.00	....

Nantungchow			
Support of second physician, $8,400 extending over a period of five years beginning 1920 (C.M. 2218)			
Balance due on previous instalments	3,450.00	....	....
Instalment due 1922	....	1,650.00	....
United Free Church of Scotland			
Mukden			
Support of nurse, $750 a year for five years beginning 1918 (C.M. 2232)			
Balance due on previous instalments	1,500.00	....	750.00
Instalment due 1922	....	750.00	....
Buildings and equipment £1,500 (C.M.2576)	....	7,000.00	6,673.13
Women's Foreign Missionary Society of the Methodist Episcopal Church			
Kiukiang			
Salary of nurse, $500 a year for five years beginning 1919 (C.M. 2359)			
Balance due on previous instalments	1,000.00	....	....
Instalment due 1922	....	500.00	....
Loss in Exchange			
To cover loss in exchange on payments to missionary societies for their hospitals (C.M. 2503)	129,923.41	....	321.03
MISSIONARY SOCIETIES—HOSPITALS AND PREMEDICAL EDUCATION			
Yale Foreign Missionary Society			
Hunan-Yale Medical School, Changsha			
Salaries and expenses of staff of hospital, premedical school and nurses' training school, Mex. 41,605 per year for five years beginning July 1, 1920 (C.M. 2454)			
Balance due on previous instalments	52,221.76	....	22,613.34
Instalment due 1922	....	50,000.00	....

EXHIBIT K—*Continued*

	Prior Appropriations	1922 Appropriations	1922 Payments
Missionary Societies—Hospitals and Premedical Education—*Continued*			
Yale Foreign Missionary Society—*Continued*			
Salaries and expenses of staff of hospital, premedical school, and nurses' training school, $6,645 a year for five years beginning July 1, 1920 (C.M. 2455)			
Instalment due 1921	$6,645.00	$........	$6,645.00
Instalment due 1922	....	6,645.00	....
Hospitals Under Chinese Management			
Central Hospital, Peking			
Salaries of Chinese doctor and nurse, $5,000 a year for three years beginning 1920 (C.M. 2464)			
Balance due on previous instalments	7,500.00	....	....
Instalment due 1922	....	5,000.00	....
Red Cross General Hospital—Shanghai			
X-ray equipment Mex. 3,000 (C.M. 2595)	....	2,000.00	....
Premedical Education			
Canton Christian College			
Equipment (C.M. 2443)	10,000.00	....	....
Salaries of two professors and one instructor, Mex. 10,200 a year for five years beginning 1920 (C.M. 2445) Instalment due 1922	....	12,000.00	....
Fukien Christian University			
Salaries of six instructors, $10,000 a year for five years beginning 1919 (C.M. 2274) Instalment due 1922	....	10,000.00	10,000.00
Salaries of Chinese instructors, $2,700 a year for five years beginning 1919 (C.M. 2275) Instalment due 1922	....	2,700.00	2,700.00
Maintenance of science department $10,000 a year for five years beginning 1919 (C.M. 2276) Instalment due 1922	....	10,000.00	10,000.00

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Ginling College			
Salary of teacher of physics, $2,400 a year for five years beginning 1920 (C.M. 2402)			
Balance due on previous instalments	1,164.00	....	....
Instalment due 1922	....	2,400.00	....
Nankai College			
Science building, Mex. 100,000 (C.M. 2591)	....	60,000.00	....
Scientific equipment Mex. 25,000 (C.M. 2592)	....	15,000.00	....
Salaries of additional science teachers, Mex. 6,750 a year for three years beginning 1923 (C.M. 2593)	....	....	....
Salary and expenses of visiting professor—1923 (C.M. 2594)	....	....	....
Peking (Yenching) University			
Maintenance of its premedical department, $7,500 a year for two years beginning 1922 (C.M. 2569) Instalment due 1922	....	7,500.00	5,625.00
St. John's University, Shanghai			
Maintenance expenses, $18,800 extending over a period of four years beginning 1920 (C.M. 2415) Instalment due 1922	....	5,500.00	5,500.00
Southeastern University			
Science building, Mex. 100,000 (C.M. 2587)	....	60,000.00	....
Scientific equipment, Mex. 25,000(C.M. 2588)	....	15,000.00	....
Salaries of additional science teachers, Mex. 6,750 a year for three years beginning 1922 (C.M. 2589) Instalment due 1922	....	4,050.00	....
Salaries and expenses of visiting professor (C.M. 2590)	....	8,000.00	2,736.72
Yale Foreign Missionary Society			
Hunan-Yale Medical School, Changsha—Heating plant for laboratory building (C.M. 2527)	3,400.00	....	3,400.00

EXHIBIT K—*Continued*

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
Premedical Education—*Continued*			
Miscellaneous			
Committee of Reference and Counsel of the Foreign Missions Conference of North America—Toward expenses of survey of education under missionary auspices in China (C.M. 2533)	$8,000.00	$........	$........
Studies of premedical education in China 1922 (C.M. 2511, 2568)	500.00	8,000.00	5,157.18
Salary of specialist in science teaching for work under the direction of the National Educational Reform Association of China, 1922–23 (C.M. 2565)	....	5,000.00	486.10
Medical Education			
Medical Schools—Affiliated			
Peking Union Medical College Asset Accounts			
Purchase of additional property (C.M. 2381)	29,808.58	....	....
Buildings and fixed equipment (C.M. 2495)	58,320.05	....	31,053.56
Alterations to original buildings (C.M. 2537, 2582)	124,900.25	28,800.00	99,605.11
Alterations to new buildings (C.M. 2566)	....	5,000.00	179.19
Alterations to Chinese houses (C.M. 2579)	....	6,000.00	2,192.01
Street improvements (C.M. 2408)	3,979.48	....	3,979.48
Movable Equipment (C.M. 2409, 2583)	44,097.21	30,600.00	43,874.52
Accessories (C.M. 2410, 2496, 2516, 2529)	31,933.04	....	13,275.26
Supplies (C.M. 2544)	40,000.00	....	20,200.09
Heavy furniture for staff residences (C.M. 2378)	8,141.62	....	399.66
Library (C.M. 244)	8,614.74	....	4,982.21
Operation			
Budget 1920–21 (C.M. 2441)	26,490.57	....	Cr. 1,588.91
Budget 1921–22 (C.M. 2535)	288,847.20	300,000.00	519,836.25
Budget 1922–23 (C.M. 2567)	....	350,000.00	....
Peking American School, Mex. 40,000 (C.M. 2501)	50,000.00	....	21,830.47
Diet investigation work (C.M. 2539)	7,500.00	7,500.00	7,387.35
Expenses of visiting professors (C.M. 2538, 2549)	10,000.00	20,000.00	20,780.26
Travel and expenses of trustees in attending dedication of College (C. M. 2494)	38,880.07	....	26,703.45

Insurance (C.M. 2514, 2545)	6,306.08	8,000.00	10,019.04
Contingent Fund (C.M. 2536, 2584)	20,000.00	35,000.00	15,236.22
Expenses in America			
Year 1921–22 (C.M. 2475, 2534)	6,726.39	5,000.00	3,013.99
Year 1922–23 (C.M. 2597)	....	1,000.00	635.71
Training Service for Chinese doctors (C.M. 2581)	....	20,000.00	....
Shanghai Medical School			
Asset Accounts			
Purchase of land (C.M. 2269, 2429)	53,508.46	....	....
Buildings and fixed equipment (C.M. 2413)	28,153.76	....	....
Accessories (C.M. 2272)	4,960.24	....	....
Library (C.M. 2215)	3,000.00	....	....
Operation			
Budget 1918–19 (C.M. 2277)	4,230.48	....	....
Medical Schools—Unaffiliated			
St. Johns University, Shanghai			
Support of instructor 1922–23 (C.M. 2596)	....	1,500.00	1,500.00
Shantung Christian University Medical School			
To cover loss in exchange (C.M. 2358)	10,327.95	....	....
Maintenance, Mex. 33,000 a year for four years commencing 1922 (C.M. 2578) Instalment due 1922	....	20,000.00	13,983.76
FELLOWSHIPS AND SCHOLARSHIPS			
Stipend, tuition, and travel (C.M. 2546, 2547, 2548, 2599)	....	53,000.00	23,771.44
Students from the Canton Christian College for study in the medical department of the University of Hongkong.			
Hongkong dollars 5,600 extending over a period of five years beginning 1922 (C.M. 2554 to 2558) Instalment due 1922—Hongkong dollars 400	....	300.00	235.00
Peking Union Medical College			
Chinese students (C.M. 2510, 2560, 2580)	1,841.49	10,000.00	2,092.14
Missionary doctors (C.M. 2564)	....	7,243.98	4,411.84

EXHIBIT K—*Continued*

	PRIOR APPROPRIATIONS	1922 APPROPRIATIONS	1922 PAYMENTS
TRANSLATION			
China Medical Missionary Association			
Publication Committee			
For use in translation work, Mex. 10,000 a year for two years beginning 1919 (C.M. 2423) Balance due on instalments	$5,882.18	$........	$........
For use in translation work Mex. 8,000 a year for two years beginning 1921 (C.M. 2532)			
Instalment due 1921	5,000.00	....	4,413.79
Instalment due 1922	....	5,000.00	....
National Medical Association of China—For expenses connected with their participation in the terminology committee, Mex. 500 a year for five years beginning 1920 (C.M. 2453) Instalment due 1922	....	600.00	....
MISCELLANEOUS			
China Medical Missionary Association—Expenses of Association, Mex. 15,000 a year for two years beginning 1922 (C.M. 2585) Instalment due 1922	....	9,000.00	....
Commission of Three Chinese Scientists—Expenses of visit to America (C.M. 2562)	....	8,500.00	....
Emergency Fund—For aid of medical work in China, at the discretion of the resident director (C.M. 2512, 2559)	878.67	1,500.00	1,567.54
Famine Relief—Sanitary work in connection with the Chinese famine relief (C.M. 2508)	10,000.00	....	....
North China American School, Tungchow—Maintenance, Mex. 5,000 (C.M. 2598)	....	3,000.00	....
North China Union Language School—Toward cost of recitation building and library, Mex. 40,000 (C.M. 2513)	45,000.00	....	....

ADMINISTRATION			
Home Office (C.M. 2552)	....	95,031.75	89,077.71
Peking Office (C.M. 2507, 2550)	19,179.42	21,500.00	26,224.78
TOTALS	$1,552,069.82	$1,494,803.36	$1,206,914.46
Unexpended balances of appropriations allowed to lapse	408,015.60	61,217.18	....
NET TOTALS*	$1,144,054.22	$1,433,586.18	$1,206,914.46
Refund of amount disbursed in prior year—Purchase of land in China (C.M. 2269)	$1,288.82		

* The Foundation appropriated to the China Medical Board for its work during the year 1922 the sum of $1,510,000.

EXHIBIT L

SUMMARY OF APPROPRIATIONS AND PAYMENTS

	Prior Appropriations	1922 Appropriations	1922 Payments
International Health Board	$695,952.92	$2,850,121.30	$1,842,376.80
China Medical Board	1,144,054.22	1,433,586.18	1,206,914.46
Medical Education	482,452.46	5,113,443.89	4,896,216.70
Schools of Hygiene and Public Health	564,071.93	7,310,079.92	7,374,151.85
Biology, Physics, and Chemistry	15,672.01	120,000.00	110,174.27
Hospital, Dispensary, and Nursing Studies and Demonstrations	30,551.90	163,173.64	141,657.05
Public Health Education and Demonstrations—Miscellaneous	30,695.62	10,000.00	40,695.62
Mental Hygiene	6,944.47	64,500.00	64,083.55
Miscellaneous	14,626.87	65,346.31	66,096.31
Administration	3,393.67	170,168.21	169,042.17
Totals	$2,988,416.07	$17,300,419.45	$15,911,408.78
Prior Appropriations	$2,988,416.07		
1922 Appropriations	17,300,419.45		
Total Appropriations		$20,288,835.52	
1922 Payments		15,911,408.78	
Balance Payable on Appropriations			$4,377,426.74

In addition to the foregoing, the Foundation has made pledges and appropriations which become effective in future years, and which will require for payment the following amounts:

Year 1923		
International Health Board	$2,500,000.00	
China Medical Board	1,400,000.00	
Medical Education	2,806,389.50	
Schools of Hygiene and Public Health	2,276,440.00	
Miscellaneous	734,691.22	
		$9,717,520.72
Year 1924		2,683,932.50
Year 1925		1,131,846.50
Year 1926		1,941,309.50
Year 1927		135,260.00
Total		$15,609,869.22

EXHIBIT M

STATEMENT OF APPROPRIATIONS AND PAYMENTS ON ACCOUNT OF SPECIAL FUNDS DURING THE YEAR 1922

	APPROPRIATIONS	PAYMENTS
Laura S. Rockefeller Funds		
Baptist Home for the Aged of New York City (R. F. 2621)	$500.00	$500.00
Baptist Home of Northern Ohio (R. F. 2619)	500.00	500.00
Euclid Avenue Baptist Church of Cleveland, Ohio (R. F. 2620)	1,500.00	1,500.00
Ministers and Missionaries Benefit Board of the Northern Baptist Convention (R. F. 2618)	500.00	500.00
	$3,000.00	$3,000.00
John D. Rockefeller Fund		
Baptist Home for the Aged of New York City (R.F. 2622, 2623)	$1,850.00	$1,850.00

EXHIBIT N

STATEMENTS OF PRINCIPAL FUNDS

General Fund

Balance of Mr. Rockefeller's gifts December 31, 1921	$171,204,624.50
Less payment of appropriation to Johns Hopkins University for the School of Hygiene and Public Health	6,000,000.00
Total	$165,204,624.50

This fund is accounted for in securities and secured demand loans.

Reserve

Balance, December 31, 1921	$3,190,533.00
Amount used to reduce the ledger valuation of a number of securities which had depreciated in value	$3,190,533.00
	0,000,000.00

Laura S. Rockefeller Funds

Gifts comprising four separate funds	$49,300.00

These funds are invested in securities.

John D. Rockefeller Fund

Gifts	$37,000.00

This fund is invested in securities.

Henry Sturgis Grew Memorial Fund

Gift to Harvard Medical School of China transferred to the Foundation in trust	$25,000.00

This fund is invested in securities.

Arthur Theodore Lyman Endowment

Amount received from Harvard Medical School of China and held as a principal fund for Shanghai Medical school	$5,500.00

This fund is invested in securities.

EXHIBIT O

LAND, BUILDINGS, AND EQUIPMENT FUNDS

	Expenditures		
	To December 31, 1921	1922	To December 31, 1922
The Rockefeller Foundation:			
Library	$3,242.95	$654.09	$3,897.04
Equipment	31,737.00	3,692.22	35,429.22
Totals, The Rockefeller Foundation	$34,979.95	$4,346.31	$39,326.26
China Medical Board:			
Peking Union Medical College:			
Original purchase	$171,013.29	$........	$171,013.29
Additional land	202,145.46	....	202,145.46
New buildings	6,925,914.91	31,053.56	6,956,968.47
Alterations—original buildings	122,299.75	99,605.11	221,904.86
Alterations—Chinese houses	....	2,192.01	2,192.01
Movable equipment	379,902.79	43,874.52	423,777.31
Accessories	399,066.96	13,275.26	412,342.22
Supplies	....	20,200.09	20,200.09
Heavy furniture for staff residences	6,858.38	399.66	7,258.04
Library	71,385.26	4,982.21	76,367.47
Street improvements	5,020.52	3,979.48	9,000.00
Shanghai Medical School:			
Land	291,491.54	Cr. 1,288.82	290,202.72
New buildings	56,654.54	....	56,654.54
Movable equipment	39.76	....	39.76
Accessories	39.76	....	39.76
Totals, China Medical Board	$8,631,832.92	$218,273.08	$8,850,106.00
Grand Totals	$8,666,812.87	$222,619.39	$8,889,432.26

EXHIBIT P

SCHEDULE OF SECURITIES IN GENERAL FUNDS ON DECEMBER 31, 1922, REPRESENTING BOTH PRINCIPAL AND INCOME TEMPORARILY INVESTED

BONDS

Name	Rate Per Cent	Date of Maturity	Amount	Price Per Cent	Foundation's Ledger Value
American Agricultural Chemical Co. First Mortgage Convertible	5	Oct. 1928	$310,000	101.	$313,100.00
American Telephone & Telegraph Co. Thirty-year Collateral Trust	5	Dec. 1946	100,000	97.75	97,750.00
Armour & Co. Real Estate First Mortgage	4½	June 1939	1,000,000	93.25	932,500.00
Atlantic & Birmingham Ry. First Mortgage	5	Jan. 1934	677,000	90.	609,300.00
Baltimore & Ohio R. R. Refunding and General Mortgage	5	Dec. 1995	650,000	99.75	648,375.00
Belgian Government Securities			Fcs 32,415,000		2,386,821.88
Chicago & Alton R. R. Refunding Mortgage	3	Oct. 1949	$551,000	65.	358,150.00
Chicago & Alton Ry. First Lien	3½	July 1950	854,000	53.	452,620.00
Chicago City & Connecting Railways Collateral Trust	5	Jan. 1927	1,305,000	85.	1,109,250.00
Chicago, Milwaukee & St. Paul Ry. General Mortgage Series "A"	4	May 1989	30,000	97.	29,100.00
Chicago, Milwaukee & St. Paul Ry. General Mortgage Series "C"	4½	May 1989	500,000	103.	515,000.00
Chicago, Milwaukee & St. Paul Ry. Debenture	4	July 1934	450,000	88.2838	397,277.50
Chicago, Milwaukee & St. Paul Ry. General and Refunding Mortgage Series "A"	4½	Jan. 2014	500,000	91.0625	455,312.50

EXHIBIT P—*Continued*

Name	Rate Per Cent	Date of Maturity	Amount	Price Per Cent	Foundation's Ledger Value
Chicago & North Western Ry. Extension	4	Aug. 15 '26	$50,000	95.	$47,500.00
Chicago & North Western Ry. Sinking Fund Debenture	5	May 1933	80,000	102.	81,600.00
Chicago Railways Co. First Mortgage	5	Feb. 1927	500,000	97.	485,000.00
Cleveland, Cincinnati, Chicago & St. Louis Ry., St. Louis Division Collateral Trust	4	Nov. 1990	73,000	90.	65,700.00
Cleveland, Cincinnati, Chicago & St. Louis Ry. General	4	June 1993	700,000	83.893	587,250.00
Cleveland Short Line First Mortgage	4½	Apr. 1961	500,000	95.	475,000.00
Colorado Industrial Co. First Mortgage	5	Aug. 1934	2,000,000	80.	1,600,000.00
Dominion of Canada, Government of, Fifteen-year	5	Apr. 1931	500,000	94.565	472,825.00
Erie R. R. General Mortgage Convertible Fifty-year Series "B"	4	Apr. 1953	1,065,000	74.7175	795,742.30
Illinois Central R. R. Refunding Mortgage	4	Nov. 1955	300,000	87.	261,000.00
Interborough Rapid Transit Co. First Mortgage (Stamped)	5	Jan. 1966	1,750,000	96.8571	1,695,000.00
International Mercantile Marine Co. First and Collateral Trust Sinking Fund	6	Oct. 1941	2,848,290	97.5	2,777,082.75
Lake Erie & Western R. R. Second Mortgage	5	July 1941	100,000	100.	100,000.00
Lake Shore & Michigan Southern Ry. First Mortgage	3½	June 1997	926,000	87.	805,620.00
Lake Shore & Michigan Southern Ry. Debenture	4	May 1931	1,673,000	92.	1,539,160.00
Magnolia Petroleum Co. First Mortgage	6	Jan. 1937	1,809,000	100.	1,809,000.00
Missouri, Kansas & Texas Ry. General Mortgage Sinking Fund (Certificates of Deposit)	4½	Jan. 1936	1,325,000	84.	1,113,000.00
Morris & Essex R. R. First and Refunding Mortgage	3½	Dec. 2000	175,000	82.75	144,812.50
Mutual Fuel Gas Co. First Mortgage	5	Nov. 1947	250,000	100.	250,000.00

National Railways of Mexico, Prior Lien Fifty-year Sinking Fund, with January 1915 and subsequent coupons attached	4½	July 1957	$50,000	59.	$29,500.00
Secured 6% Notes for coupon due January 1, 1914		Jan. 1917	1,125	59.	663.75
Guaranty Trust Co. Receipt for July 1, 1914 coupon			1,125	59.	663.75
New York Central Lines Equipment Trust of 1913	4½	Jan.'23–'28	216,000	99.0393	213,924.91
New York Central & Hudson River R. R. Thirty-year Debenture	4	May 1934	330,000	88.45	291,885.00
New York, Chicago & St. Louis R. R. First Mortgage	4	Oct. 1937	35,000	95.	33,250.00
New York, Chicago & St. Louis R. R. Debenture	4	May 1931	1,303,000	87.	1,133,610.00
New York Connecting R. R. First Mortgage	4½	Aug. 1953	500,000	95.69073	478,453.65
Northern Pacific Ry. Refunding and Improvement Mortgage	4½	July 2047	390,000	91.577	357,150.00
Pennsylvania R. R. Consolidated Mortgage Sterling	4	May 1948	£2,400	99.	11,880.00
Pennsylvania R. R. General Mortgage	4½	June 1965	$1,500,000	98.25	1,473,750.00
Pittsburg, Cincinnati, Chicago & St. Louis Ry. Consolidated Mortgage Series "I"	4½	Aug. 1963	500,000	103.	515,000.00
Reading Co.—Philadelphia & Reading Coal & Iron Co. General Mortgage	4	Jan. 1997	500,000	94.25	471,250.00
Rutland R. R. First Consolidated Mortgage	4½	July 1941	25,000	90.	22,500.00
St. Louis—San Francisco Ry. Prior Lien Series "A"	4	July 1950	1,500,000	72.75	1,091,250.00
Seaboard Air Line Ry. Adjustment Mortgage	5	Oct. 1949	455,000	77.	350,350.00
Southern Pacific R. R. First and Refunding Mortgage	4	Jan. 1955	100,000	86.	86,000.00
United States Fourth Liberty	4½	Oct. 15 '38	1,075,000	93.21347	1,002,044.80

EXHIBIT P—*Continued*

Name	Rate Per Cent	Date of Maturity	Amount	Price Per Cent	Foundation's Ledger Value
United States Second Liberty Converted	4¼	Nov. 15 '42	$2,100,000	93.00921	$1,953,193.40
United States Government Treasury Certificates	3¾	June 15 '23	1,000,000	100.	1,000,000.00
United States Government Treasury Notes Series "C"	4¾	June 15 '25	3,000,000	100.	3,000,000.00
United States Government Treasury Notes	4¼	Sept 15 '26	1,000,000	100.	1,000,000.00
Wabash R. R. Second Mortgage	5	Feb. 1939	120,000	97.8	117,360.00
Washington Ry. & Electric Co. Consolidated Mortgage	4	Dec. 1951	450,000	83.5	375,750.00
Western Maryland R. R. First Mortgage	4	Oct. 1952	1,032,000	78.8913	814,158.76
Wheeling & Lake Erie R. R. Lake Erie Division First Mortgage	5	Oct. 1926	140,000	100.	140,000.00
Wheeling & Lake Erie R. R. Equipment Trust Series "B"	5	Apr.'23–'27	250,000	99.75	249,375.00
Wilson Realty Co. First Mortgage	6	July 1929	7,500	95.	7,125.00
Total Bonds					$39,629,937.45

EXHIBIT P—*Continued*
STOCKS

Name	Number of Shares	Price per Share	Foundation's Ledger Value
American Ship Building Co. Common	24,260	54.173537	$1,314,250.00
Anglo-American Oil Co. Ltd. (Par £1)	366,517	30.5	11,178,768.50
Atchison, Topeka & Santa Fe Ry. Preferred	5,000	98.25	491,250.00
Atchison, Topeka & Santa Fe Ry. Common	21,100	95.2563	2,009,908.33
Borne-Scrymser Co.	720	59.	42,480.00
The Buckeye Pipe Line Co. (Par $50)	49,693	100.	4,969,300.00
Central National Bank, Savings & Trust Co. Capital	950	177.8538	168,961.10
Chehalis & Pacific Land Co. Capital	220	34.9095	7,240.10
Chesebrough Manufacturing Co. Consolidated	2,070	220.4522	456,336.14
Chicago City & Connecting Rys. Participation Certificates Preferred	17,530	15.	262,950.00
Chicago City & Connecting Rys. Participation Certificates Common	10,518	2.	21,036.00
Chicago & Eastern Illinois Ry. Preferred	3,000	34.	102,000.00
Cleveland Arcade Co. Capital	2,500	98.6222	246,555.56
Cleveland Trust Co. Capital	457	195.7541	89,459.62
Colorado & Southern Ry. First Preferred	4,800	54.	259,200.00
Consolidated Gas Co. of N. Y. Capital (No par value)	40,000	61.8868125	2,475,472.50
The Continental Oil Co.	20,550	62.2473	1,279,182.61
The Crescent Pipe Line Co. (Par $50)	14,120	60.	847,200.00
Cumberland Pipe Line Co.	6,000	40.6666	244,000.00
Erie R. R. First Preferred	21,400	45.8306	980,773.76
Eureka Pipe Line Co.	12,357	175.	2,162,475.00

EXHIBIT P—*Continued*

Name	Number of Shares	Price per Share	Foundation's Ledger Value
Galena Signal Oil Co. Preferred	4,193	$139.7	$585,779.50
Galena Signal Oil Co. Common	20,000	170.94	3,418,790.04
Great Lakes Towing Co. Preferred	1,527	88.7361	135,500.05
Great Lakes Towing Co. Common	1,200	12.	14,400.00
Indiana Pipe Line Co. (Par $50)	24,845	105.1111	2,611,485.28
Kanawha & Hocking Coal & Coke Co. Preferred	202½	100.	20,250.00
Kanawha & Hocking Coal & Coke Co. Common	668¼	90.953	60,779.97
Manhattan Ry. Capital (Certificates of Deposit)	10,000	100.	1,000,000.00
Missouri Pacific R. R. Convertible Preferred	17,880	55.50	992,340.00
National Transit Co. (Par $12.50)	126,481	28.5	3,604,708.50
New York Transit Co.	12,392	150.	1,858,800.00
Northern Pacific Ry. Common	700	91.7625	64,233.75
Northern Pipe Line Co.	9,000	110.	990,000.00
Pere Marquette Ry. Preferred	5,740.8	54.56	313,248.00
Provident Loan Certificates (Par $5,000)	40	100.	200,000.00
Seaboard Air Line Ry. Preferred	4,300	10.	43,000.00
Seaboard Air Line Ry. Common	3,400	5.	17,000.00
The Solar Refining Co.	9,076	92.5035	839,561.76
Southern Pipe Line Co.	24,845	125.	3,105,625.00
South West Pennsylvania Pipe Lines	8,000	125.	1,000,000.00
Standard Oil Co. (Indiana) (Par $25)	478,760	43.35	20,754,246.00
The Standard Oil Co. (Kansas) (Par $25)	78,624	17.1885	1,351,433.05
Standard Oil Co. (Nebraska)	7,446	90.	670,140.00
Standard Oil Co. (New Jersey) Non-voting Cumulative Preferred	55,000	102.8729	5,658,008.48

Standard Oil Co. (New Jersey) Common (Par $25)	919,500	36.475	33,538,762.50
The Standard Oil Co. (Ohio) Common	33,912	102.	3,459,024.00
The Standard Oil Co. (Ohio) Non-voting Cumulative Preferred	17,088	106.	1,811,328.00
Tilden Iron Mining Co. Capital	1,780	27.35	48,683.46
Union Tank Car Co. Common	36,000	44.6135	1,606,087.97
Virginia-Carolina Chemical Co., Voting, no par, Class "A" Common	35,000	27.	945,000.00
Virginia-Carolina Chemical Co., Non-voting, no par, Class "B" Common	8,750	18.	157,500.00
Washington Oil Co. (Par $10)	1,774	30.	53,220.00
Western Pacific R. R. Corporation Preferred	20,195	43.50	878,482.50
Western Pacific R. R. Corporation Common	30,292½	15.25	461,960.62
Wilson Realty Co. Capital	591	100.	59,100.00
Woman's Hotel Co. (In liquidation) Capital	300	20.	6,000.00
TOTAL STOCKS	....	....	$121,943,277.65

SUMMARY

Bonds	$39,629,937.45
Stocks	121,943,277.65
Total ledger value of investments belonging to General Fund	$161,573,215.10

EXHIBIT Q

SCHEDULE OF SECURITIES IN SPECIAL FUNDS ON DECEMBER 31, 1922

John D. Rockefeller Fund

BONDS

Name	Rate Per Cent	Date of Maturity	Amount	Price Per Cent	Foundation's Ledger Value
Canada Southern Ry. Consolidated Mortgage Series "A"	5	Oct. 1962	$37,000	100.	$37,000.00
Total Bonds					$37,000.00

Laura S. Rockefeller Fund

BONDS

Name	Rate Per Cent	Date of Maturity	Amount	Price Per Cent	Foundation's Ledger Value
Colorado Industrial Co. First Mortgage	5	Aug. 1934	$50,000	80.	$40,000.00
Virginia-Carolina Chemical Co. First Mortgage	5	Dec. 1923	10,000	93.	9,300.00
Total Bonds					$49,300.00

Henry Sturgis Grew Memorial Fund
BONDS

United States Second Liberty Loan Converted...........	4½	Nov. 15 '42	$25,850	96.71167	$25,000.00
Total Bonds..................................	....	....	....	....	$25,000.00

Arthur Theodore Lyman Endowment
BONDS

United States Fourth Liberty Loan....................	4½	Oct. 15 '38	$5,850	94.01709	$5,500.00
Total Bonds..................................	....	....	....	....	$5,500.00

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